


ANNOTATION MANAGER
AN AUTOMATED WEB-BASED CONTENT MANAGEMENT SYSTEM FOR
DIGITAL LIBRARIES WITH ANNOTATED BIBLIOGRAPHIES

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Annotation Manager
*An Automated Web-based Content Management System for
Digital Libraries with Annotated Bibliographies*

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Abstract

With the expansion of the World Wide Web in the 90s, individuals (especially students) are always on a quest for information resources especially in the form of Web sites. Yet many of them are overwhelmed when faced with deciding which site will best suit their research needs. As a result, these individuals may select a resource for less than optimal reasons. To ease some of the burden, libraries have made great advances to provide a place to organize information resources. Such places are called library portals, and they typically provide a gateway to web resources by categorizing and annotating them and creating a direct link to each resource. These annotated links are pre-evaluated by librarians and only placed online if their content seems valuable. If the links reside on static HTML web pages, the task of maintaining a portal can be fairly time consuming. The aim of this thesis is to research an easier and faster way to develop a library portal that provides up-to-date content on its interface, without having to redevelop the portal website every time.

To meet these needs, a new kind of administrative library portal called the Annotation Manager has been developed. It is designed for storing annotations in a database and dynamically displaying them on the end user interface. This format also allows the user to query the database and retrieve search results according to his/her research needs. The Annotation Manager also contains an administrative panel, through which administrative users (i.e., librarians and faculty members) may log in, modify content and perform maintenance on the database as necessary. This can include everything from the addition of new categories, categories within categories, and annotations belonging to those categories. Moreover, to preserve the data integrity of the

links themselves, the Annotation Manager involves a batch program called LinkCheck that runs periodically each week to validate the existence of each link.

This thesis compares the Annotation Manager with other currently available tools, followed by a detailed explanation of the database structure. It also provides instructions on how to use the three components of this product: the End User Interface, Administrative Panel, and LinkCheck. This thesis also demonstrates the capabilities of the Annotation Manager by developing a working prototype, and outlines possible future enhancements that can be made to this product to make it even more valuable to users and librarians alike.

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1. Introduction

As the amount of digital information grows, there is an increasing need for transforming the chaos of the Web into order. Everybody wants to use the Web in a simpler and more orderly way.

With the advent of the Web search engines back in the early 90s came great satisfaction in meeting this need, by offering direct links to indexed documents within the Web environment [Zhou03]. Initially, most Web users were researchers and educators with high-speed Internet access; so academic librarians began instructing them on how to use Web search engines. When more and more websites began emerging, it became evident that users were being bombarded with an overload of information. A surplus of information also requires a manual comparison between the results returned from several resources and does not enable the user to move from one resource to another.

To eliminate the average user's frustration and to reduce the time needed to locate relevant information, a new type of Web site called a "portal" emerged. It was unique in that it provides information content to serve a specific community [Sadeh03]. These Web portals have been further subdivided into "library portals," which typically provide a gateway to an institution's resources by listing them for users and creating a direct link to the native interface of each resource [Sadeh03]. This categorization is a step further from the general search engine; the Web provides broad information for a broad audience and the library portal provides narrowed information for a broad audience.

2. Motivation

In today's world, having various types of information at one's fingertips has become essential. The field of library science provides this service through its vast collection of data made available for the general public to access. Within that scope, the end user also expects this collection to have both of the following characteristics: resources must be accurate and up-to-date, and they must be organized in an easy-to-find fashion.

Although the Internet, especially with the Web, has made it easier to place these resources in a central location, librarians are now faced with the task of determining how to do so. For this, the field of computer science is drawn upon, as librarians begin to create and develop Hypertext Markup Language (HTML) pages to provide links to these resources through the use of annotated bibliographies. An annotation is a concise description of a particular work (or another website), including important aspects of content not evident in the title. It enables the researcher to establish the relevance of a specific resource and to decide whether to read the full text of the work. A bibliography is a list of accurate citations for a number of sources on a certain topic [Bobish02]. So, an annotated bibliography is a combination of the above: a list of accurate citations and annotations for a number of sources on a certain topic. Such a bibliography can prove to be helpful to the average user who knows which category to browse while researching, yet does not know which resource to select out of a given collection. An annotated bibliography to online resources has the following additional characteristics: a title (perhaps the title to the online resource itself), a short description of the resource, and the Uniform Resource Locator (URL) address to it.



The biggest problem with presenting such annotations online is that HTML pages are static and thereby limited – every time the online text must be changed, librarians must modify the underlying markup language and upload the changes back to the server. So although this process keeps the information up-to-date and organized, it becomes tedious and time-consuming on the part of the librarian.

Therefore, it is the intent of this project to research and develop an easy and fast way of generating these online annotations created and maintained by librarians, available for public use. Such a service will relieve librarians from the task of learning HTML and other web development technologies in order to provide accurate resources to the end user, who will see the information as being updated ‘on the fly’ daily. It will also allow for faster data entry, as librarians will be able to input more information and even take the time to focus on the overall organization of all resources involved. Overall, if such a product could be developed, it will prove to be of great benefit both to those who create the annotations as well as to those who choose to use them.

2.1 Desired Features

Some of the features in mind for this ideal product include the ability to present information dynamically, based on the data input by the administrators of this service. The means of providing input data should be user-friendly to the non-technical administrator (meaning everything on the administrative panel must be self-explanatory) and the complete data entry process must allow for easy additions, updates, and deletions to data records. The model product must be flexible enough to work with a hierarchical (tree-like) structure of categories as necessary. A tree is defined to be a data structure

accessed beginning at the root node [Black03]. Each node is either a leaf or an internal node. An internal node has one or more child nodes and is called the parent of its child nodes. All children belonging to the same parent are siblings. Consequently, internal nodes are able to form subtrees of their own with their children. Within the context of this product, a data structure like this is a perfect representation of how categories are organized in the field of information sciences. Categories may easily serve as internal nodes if they can be broken up into several subcategories, and so on. Leaf nodes, on the other hand, do not have any children. Categories may be leaf nodes if they have been broken down as far as possible. Annotations to online resources usually belong to a leaf node rather than internal nodes. And contrary to a physical tree, the root is usually depicted at the top of the structure (as shown in Figure 1), the first level of children directly beneath are referred to as the “first tier,” the second level as “second tier,” and so on, until the leaves are depicted at the bottom.

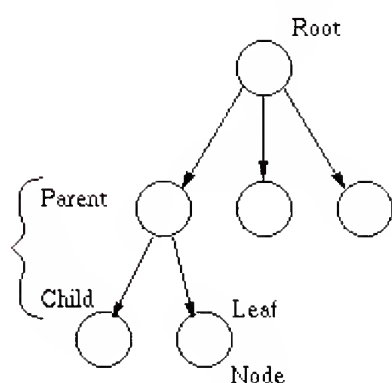


Figure 1. Tree data structure

Keeping with the fact that the user interface of this product may show such a hierarchical structure to the annotation categories, it must be easy to move categories around, as well as create new subtrees as needed. Also, there must be periodic updates

performed behind the scenes on these annotation Uniform Resource Locators (URLs) to verify their accuracy. It is a well-known fact that websites may relocate or disappear altogether at any point in the future. In such cases, it becomes discouraging to the average user when he/she selects an annotation URL and realizes it is a dead link (one that leads to a web page or site that has either moved or no longer exists). It is best to avoid such a problem by continuously checking every URL periodically.

Taking into account these basic facts, it is essential to explore what the other library information services have to offer, and then evaluate the chances of existing products and services filling the gap of such needs thus substantiating the likelihood of success of the Annotation Manager within libraries everywhere.

3. Survey of Other Products on the Market

This section performs a comparison of three existing library portals on the Web. Hence, one will be able to see how exactly the Annotation Manager will benefit its users.

3.1 BadgerLink by the State of Wisconsin Department of Public Instruction

BadgerLink is a library portal maintained by the Wisconsin Reference & Loan Library, and is located at http://www.badgerlink.net/ref_links.html. As stated on its homepage, it is meant to “provide Wisconsin residents access to quality online information in cooperation with the state’s library community” [Wisconsin04]. Here, BadgerLink provides a Subject Resource Guide to find links by category. This list is contained within one static HTML webpage, and uses a limited number of categories (none of which are nested within each other). Though the links and their annotations are neatly laid out, the website lacks search capabilities, and any periodic checks on the links to see if they still exist. BadgerLink also does not allow a user to suggest a link, nor does it show if any links have been recently added or updated.



Figure 2. BadgerLink

3.2 Buley Library Subject Guides

Found on the Southern Connecticut State University website (<http://library.scsu.ctstateu.edu/userguides.html>), the Buley Library provides a Subject Guide off their main website to those students who wish to browse by subject area. One critic of this portal makes the observation that “this list covers most topics, but unevenly; some are reasonably thorough, while others are quite incomplete” [O’Leary00]. A glance at the website’s address suggests that it is not dynamic in the way it provides its page contents, nor are its annotations organized in a uniform way. Although the online portal does not include advanced features (such as search capabilities), it has a solid foundation on how to gather and present subject guides in general.

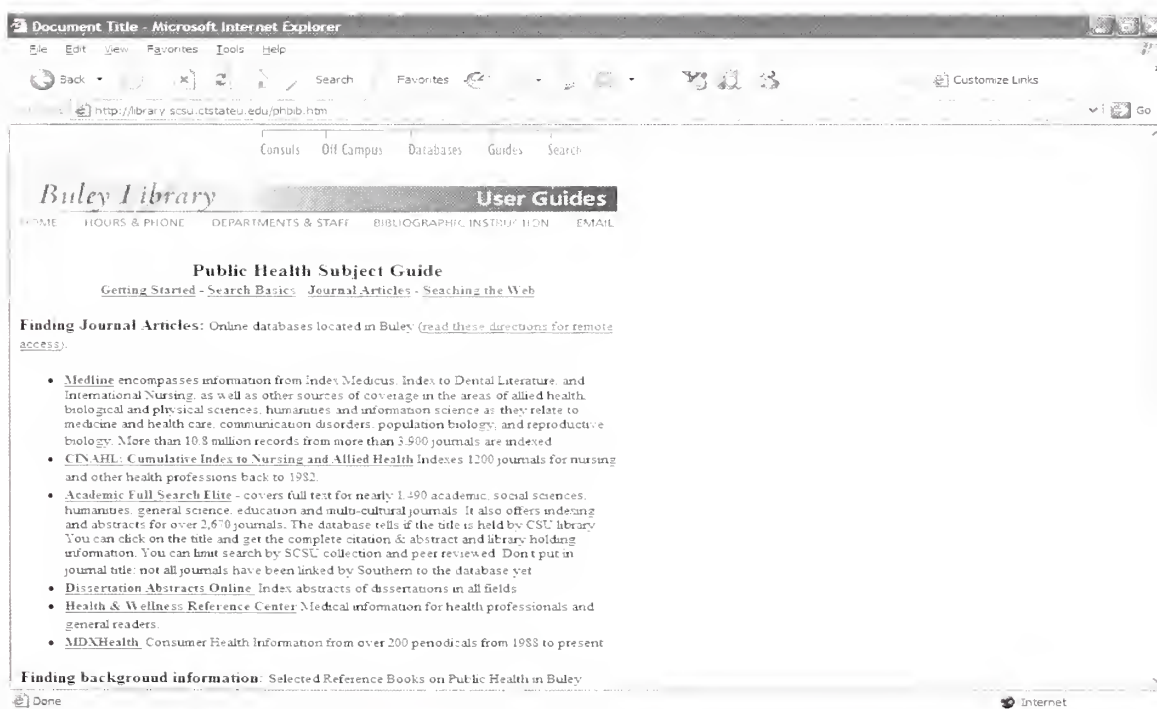


Figure 3. Buley Library Subject Guide

3.3 The Internet Public Library

As described in the *Educational Leadership* magazine, “the Internet Public Library (www.ipl.org) provides a wealth of resources categorized by content areas, including arts and humanities, business and economics, social sciences, and science and technology” [Thorp02]. It is an attractive subject guide that includes detailed annotations within an easy-to-navigate layout. It allows for categories to be found inside other categories, and even has a basic Search feature to query the collection. However, the Internet Public Library does not indicate new or updated links, nor does it allow for the suggestion of links from users. And although its pages are dynamic (most likely database-driven), its links are not validated periodically.

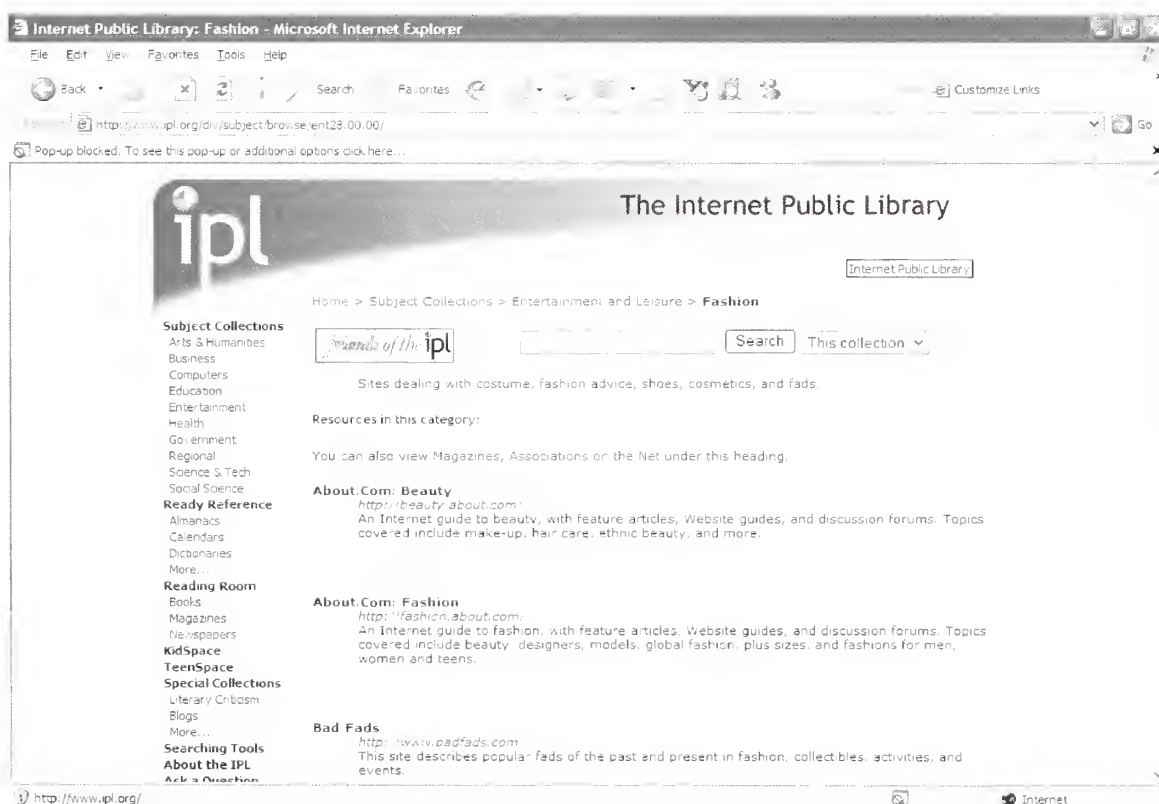


Figure 4. Internet Public Library

3.5 The Annotation Manager

The product developed as a part of this thesis work is called the Annotation Manager, which provides a subject guide of annotated resources to the public, and allows the librarians to maintain these annotations behind-the-scenes using an administrative panel connected to a relational database. This avoids the situation in which librarians have to constantly modify the static web pages, and instead allows for real-time updates to the end user interface from the panel. The system also provides a capability to create categories within categories as needed. Moreover, this system includes a batch program named LinkCheck to periodically check every link in the database to verify its existence and to detect any updates on the destination webpage. Meanwhile, unlike the rest of the library portals discussed above, the Annotation Manager generates an interface in which a user is able to browse, search, and even suggest links and annotations of their own.

3.6 Comparison of Products

Table 1 lists features of all products described above and compares them with those of the Annotation Manager.

Table 1. Comparison of Features of Library Portals

	Annotation Manager	BadgerLink	Buley Library	Internet Public Library
Dynamic pages	Yes	No	No	Yes
Suggest a Link	Yes	No	No	No
Descriptive annotations	Yes	Yes	Yes	Yes
Nested categories	Yes	No	No	Yes
Searchable	Yes	No	No	Yes
Link validation	Yes	No	No	No
Icons	Yes	No	No	No

4. Data Representation in Annotation Manager

All annotation data is housed in a Microsoft Access database for the purpose of this application. A relational database such as Microsoft Access was chosen over an XML (eXtensible Markup Language) file mostly for the use of primary and foreign keys. Since each annotation and category requires a unique way of identification, it was most essential to have a unique number auto generated every time a new annotation and/or category is added. XML cannot provide this feature easily, nor can it resolve foreign keys to other tables. Another advantage of using the Microsoft Access database is that the data can be formatted within the database itself – after it is entered and before it is retrieved again. This proved to be a handy feature when dates needed to be formatted upon retrieval, and default values had to be assigned in certain circumstances when no data had been input.

4.1 Organizational structure of Categories

Similar to how a library attempts to organize and shelve books about the same subject matter together, annotation resources can also be classified according to their content. The two major classification systems used in American libraries to organize books are the Dewey Decimal Classification System and the Library of Congress Classification System.

The Dewey Decimal System is the older of the two and is used on smaller collections. It divides all the world's knowledge into ten broad categories, referred to as the First Summary. These categories include Generalities, Philosophy & Psychology, Religion, Social Sciences, Language, Natural Sciences & Mathematics, Technology

(Applied Sciences), The Arts, Literature & Rhetoric, and Geography & History. The first level is further broken down into narrower subdivisions, called the Second Summary. The Second Summary breaks down further, and so on and so on. Each subdivision classifies knowledge into more specific units.

i.e. Natural Sciences & Mathematics

Astronomy & allied sciences

Specific celestial bodies

Planets

Mars

The Library of Congress Classification System organizes knowledge into twenty-one broad categories, but it is based on the actual books owned by the Library of Congress and attempts to classify those books into meaningful subject categories. Categories include: General Works, Philosophy/Psychology/Religion, Biography, History (Old World), History (New World), Geography & Sports, Social Sciences, Political Science, Law, Education, Music, Fine Arts, Literature, Science, Medicine, Agriculture, Technology, Military Science, Naval Science, and Library Science & Bibliographies. The Library of Congress system is organized around pragmatic choices (the way it works best for the Library of Congress' actual book collection), rather than basing it on an underlying philosophical system. It is used by most research and university libraries in the U.S. (and several other countries), although most public libraries continue to use the Dewey Decimal Classification.

No matter which method of classification is used, it becomes obvious that every annotation must belong to a single category by definition. This category may in fact be a

subcategory to another parent category, which in turn may be a subcategory to another. Therefore, this pattern establishes a taxonomy that an Annotation Manager must be able to manipulate. For example: it may become necessary for an annotation to be reclassified as belonging to another category. And although the two classification systems have predefined categories and subcategories, a truly flexible Annotation Manager must even provide the ability to add, edit, and delete categories as needed.

4.2 Description of user levels:

One of many unique features of the Annotation Manager is its ability to handle a diverse range of users. This product has two types of users: those whose access is limited only to the end user interface, and those who can view it, as well as perform administrative maintenance via the administrative panel. Throughout this work, the term “users” will refer to the former group, whereas the latter group may be referred to as “administrative users.” A user is anyone who chooses to browse the Annotation Manager website. An administrative user, however, has the ability to perform maintenance on the Annotation Manager’s database through the Administrative Panel. These administrative users are each assigned a username and password to allow them to successfully login to the panel. Additionally, each administrative user is assigned an access level, by which the system may limit the extent of their maintenance capabilities.

4.2.1 Administrator

An administrator is an individual with Level 1 access. This allows him/her to do the following:

- View, add, or edit any category;

- View, add, or edit any annotation;
- View, add, or edit administrative users; and
- Approve any suggested links from end users

4.2.2 Liaison

A liaison is an individual with Level 2 access. This limits him/her in the following ways:

- Can only edit categories assigned to him/her;
- Can only add categories under those categories already assigned to him/her;
- Can only edit annotations in assigned categories;
- Can only add annotations into assigned categories;
- Cannot view, add, or edit administrative users; and
- Can approve user-suggested links belonging to assigned categories.

4.2.3 Dept

A dept (department) member is an individual with Level 3 access. This level has the most number of limitations as such:

- Cannot add or edit categories;
- Can only edit annotations within assigned categories;
- Can only add annotations into assigned categories;
- Cannot view, edit, or add administrative users; and
- Cannot approve any user-suggested links.

Thus, the Annotation Manager can have multiple administrative users, each with various administrative capabilities, thereby safeguarding the integrity of the data overall.

4.3 Database structure

This section describes the structure of the Microsoft Access database used in the implementation of the Annotation Manager. As stated above, data storage is a key element to the success of this product simply because it is not practical to spend countless hours adding and modifying the contents of static HTML pages that display the annotated bibliography. It is much more efficient (and certainly less time-consuming!) to allow a database engine to store and display the data as needed. To do so, the database created for this project had to be designed with multiple relational tables to accommodate the many features of the Annotation Manager.

Below is a list of all the tables found within the project database, as well as a summary of each field used per table:

4.3.1 tblAnnotations

tblAnnotations holds every annotation kept in the database. It includes annotations that have been suggested, those that have “expired,” and those that have been recently updated.

Table 2. Field descriptions of tblAnnotations

Field Name	Data Type	Primary/ Foreign Key?	Required?	Description
AnnID	AutoNumber (Long Integer)	Primary	Yes	Auto generated number for each annotation entered. Guarantees that each annotation will be uniquely identified
CatID	Number (Long Integer)	Foreign	Yes	Identifies which category each annotation belongs. Uses a foreign key to field CatID within tblCategories.
AnnTitle	Text (max 200 chrs)	None	Yes	Title of the annotation resource.
AnnDesc	Memo (max 64000 chrs)	None	Yes	A short description of the website
AnnURL	Text (max 255 chrs)	None	Yes	URL of the resource
AnnCreated	Date (mm/dd/yyyy)	None	Yes	Date this annotation was created. This information is used later on the end-user interface to flag as “New” if needed.
AnnContentLen	Number (max 8 bytes) Default=0	None	Yes	Length (in characters) of the text found at the destination URL
AnnUpdated	Boolean (Yes/No)	None	Yes	A Yes/No flag to indicate whether a URL has been recently updated. This flag will be turned on based on change in the length of the website content.
AnnStatus	Text (max 50 chrs) Default=Active	None	Yes	Indicates whether an Annotation is Active, InActive, or Wait. Only those that are active will be available for display.

4.3.2 tblCategories

tblCategories is the entity that lists every category (and subcategory) in the cataloging structure. To keep the hierarchy in tact, it operates under the basic assumption that every category will have a parent category. The highest parent category is named “Root” by default to determine whether a category is at the First tier or not.

Table 3. Field descriptions of tblCategories

Field Name	Data Type	Primary/ Foreign Key?	Required?	Description
CatID	AutoNumber (Long Integer)	Primary	Yes	Auto generated number for each category entered. Guarantees each category will be uniquely identified
CatTitle	Text (max 100 chars)	None	Yes	Title of the category
CatOwner	Text (max 50 chrs)	Foreign	Yes	Identifies which userID each category belongs. Uses a foreign key to field UserID within tblUsers.
CatOwnerEmail	Text (max 50 chrs)	None	Yes	Gives a contact email address of the category owner. This field is best used to notify the owner of any dead links in his/her category
CatDesc	Memo (max 64000 chrs)	None	No	A description of the category and what it includes. Can even be a quote in the subject matter.
ParentID	Number (Long Integer)	Foreign	Yes	Identifies which parent category each category belongs. Uses a foreign key to field CatID within the same table.

4.3.3 tblUsers

tblUsers serves to list all the administrative users who can log in to the administrative panel to manage the online Annotations. Each administrative user is labeled with a specific access level, as well as other contact information.

Table 4. Field descriptions of tblUsers

Field Name	Data Type	Primary/ Foreign Key?	Required?	Description
UserID	Text (max 50 chrs)	Primary	Yes	Different userids created to guarantee that each will be uniquely identified
UserPwd	Text (max 50 chrs)	None	Yes	Password defined to access the administrative panel
UserType	Number (Long Integer)	Foreign	Yes	Identifies which type each user belongs, thus sets the access level. Uses a foreign key to field UserType within tblUserTypes.
UserEmail	Text (max 50 chrs)	None	Yes	Gives a direct contact email address to the user.

4.3.4 tblUserTypes

tblUserTypes lists the various access levels that are available in the Annotation Manager

Table 5. Field descriptions of tblUserTypes

Field Name	Data Type	Primary/ Foreign Key?	Required?	Description
UserType	Number (Long Integer)	Primary	Yes	Various user access levels, defined numerically
UserTypeDesc	Text (max 50 chrs)	None	Yes	Text description per access level (Admin, Liaison, Dept)

4.3.5 tblUserCats

tblUserCats is an entity to define the access limitations of each administrative user within the system. For each user, a Level 1 administrator can select which categories he/she is allowed to add, edit, and/or delete. For example, although multiple faculty members may hold the 'Dept' access level, it is important to limit each to their area of expertise.

Table 6. Field descriptions of tblUserCats

Field Name	Data Type	Primary/ Foreign Key?	Required?	Description
UserID	Text (max 50 chrs)	Primary & Foreign	Yes	Refers to individual users through the field UserID from table tblUsers.
CatID	Number (Long Integer)	Primary & Foreign	Yes	Refers to various categories through the field CatID from table tblCategories.

Figure 5 is an entity-relationship diagram to demonstrate how primary and foreign keys are used in this database structure. The primary keys appear bolded.

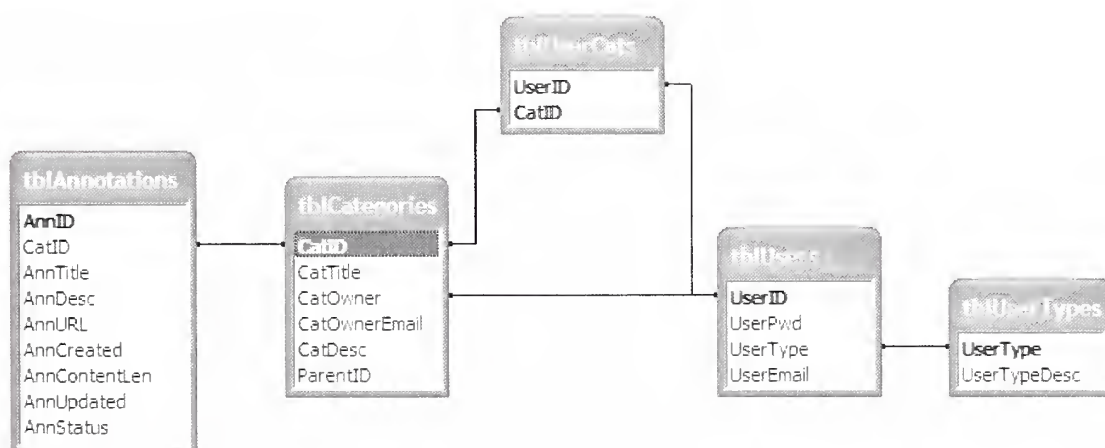


Figure 5. Entity Relationship diagram

5. Implementation of Annotation Manager

5.1 Language of Choice

There are a number of Web development languages available to developers today. Many of these methods involve preprocessing – embedding code into HTML pages with special tags that signal to a preprocessor that they contain code, and that it should do something with it.

The Annotation Manager was developed with Microsoft ASP.NET for a number of reasons. For example, ASP.NET is unique in that it works with scripted languages such as VBScript, and JScript, as well as compiled languages such as Visual Basic .NET. This proved to be useful in performing data validation on the user's input before sending it to the database. The framework also provides for true object-oriented programming (OOP), and true inheritance, polymorphism, and encapsulation are supported [Amundsen01]. This was especially true in the area of forms authentication (a feature unique to ASP.NET), which was used to secure the Administrative Panel of the Annotation Manager with a minimal amount of code.

Besides the programming language and the methodology, database access is a significant concern. ASP.NET allows for integration with databases to be accomplished through ODBC, which provides a consistent set of calling functions to access the target database [Amundsen01].

6. End user Interface

6.1 Browsing by Category, subcategories

The primary purpose of the Annotation Manager is to display to the end user an annotated bibliography of online resources organized in various categories and subcategories. To begin, however, the user is first shown a list of categories (like those seen in Figure 6) located within the First Tier directly below the root. From that list, the user may easily choose which category to browse.

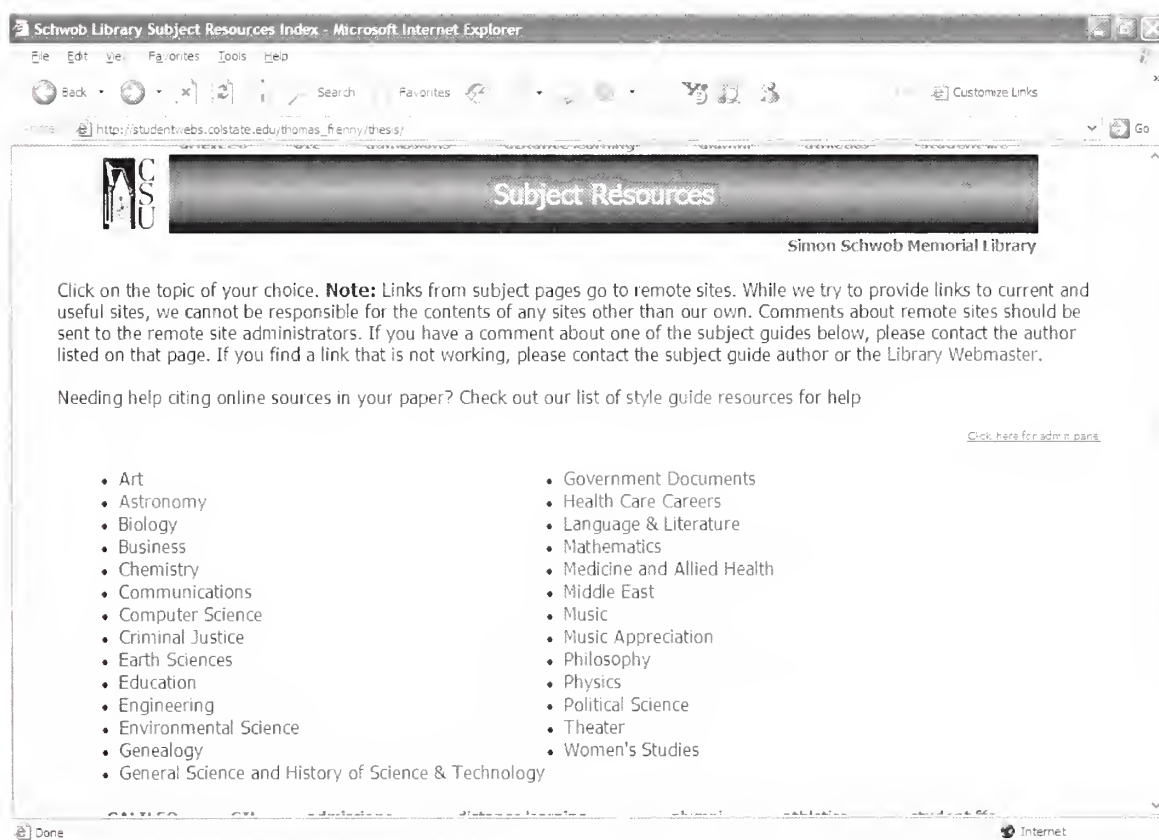


Figure 6. End User - displaying all First Tier categories

Upon selecting a category, the end user is able to view a description of that category (if there is description) as well as all corresponding subcategories. As shown in

Figure 7, these subcategories are collected together in an ordered index near the top of the page, with quick links to their respective sections further below.

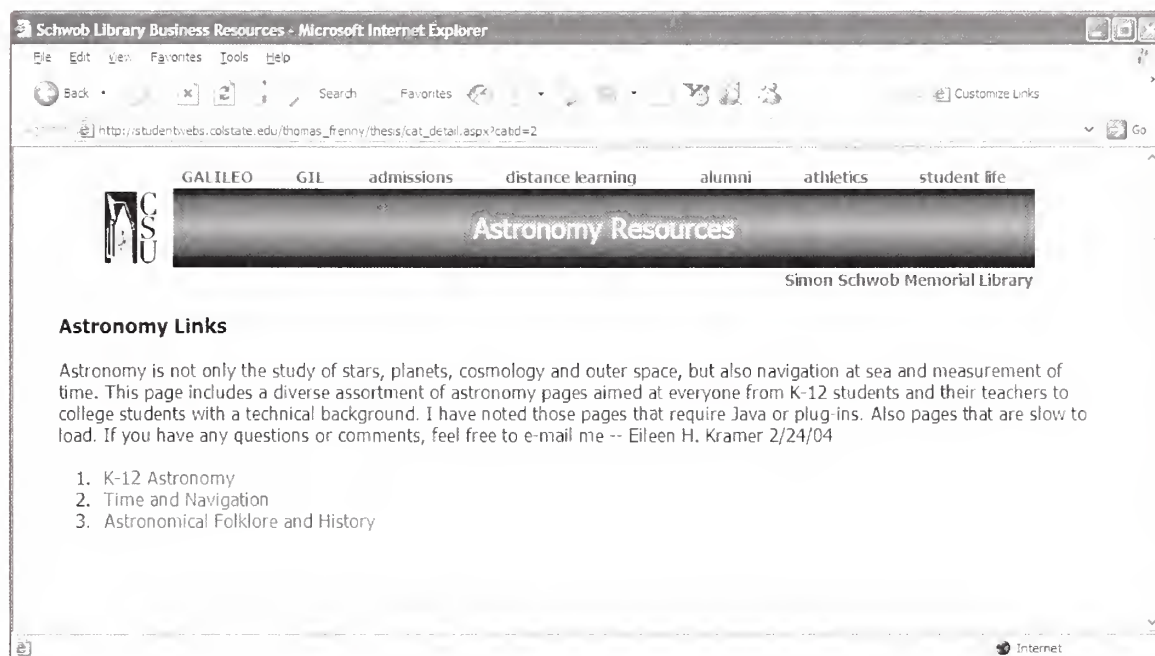


Figure 7. End User - Category description and subcategory index

Each section listed below the quick links provides all annotated links (grouped by their respective subcategories), along with titles and descriptions for each annotation. Titles are ordered in ascending sequence, so as to allow the end user to quickly find what he/she is looking for. Also, selecting an annotated link will open the URL in a new browser window, so as not to lose the currently displayed page. If a particular annotation has been added recently (within the last seven days), an icon labeled "New" will display on the same line. Likewise, if the destination URL of an annotation resource has recently had some changes to its web page, another icon labeled "Update" will appear to highlight such a change to the end user (see Figure 8).

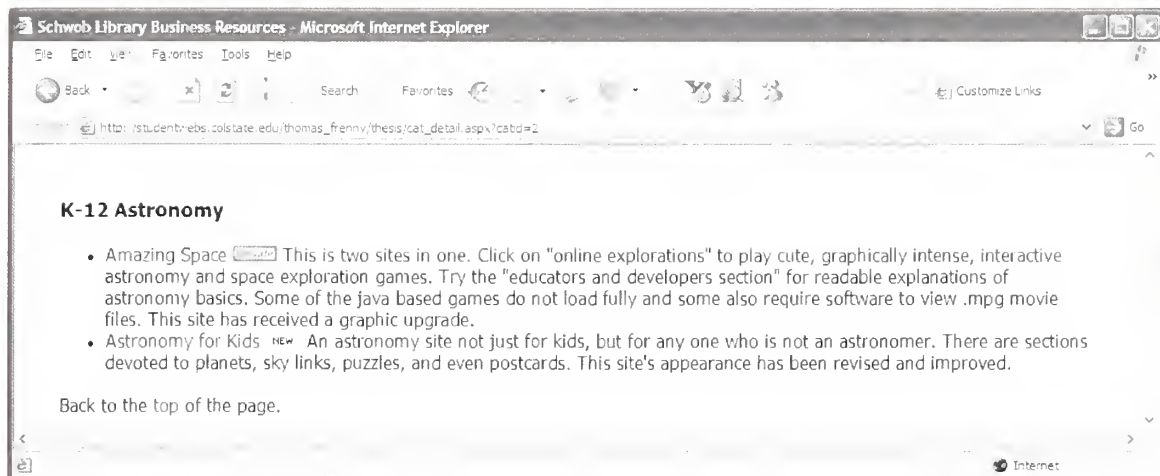


Figure 8. End User - Highlighting "New" and "Updated" URLs

While listing all subcategories under the current category, if a particular subcategory is detected to have children of its own, its related annotated links will not be displayed within the same page. Instead, the category title will appear as a hyperlink (as seen in Figure 9), along with the description "Click the above link for further subcategories" underneath. This invites the user to browse yet another tier of categories if interested. Selecting the subsequent link will produce a category description page that looks identical (in format and layout) to the previous page viewed. Thus the user is able to visit as many tiers and go as deep as necessary within the overall hierarchy of categories.

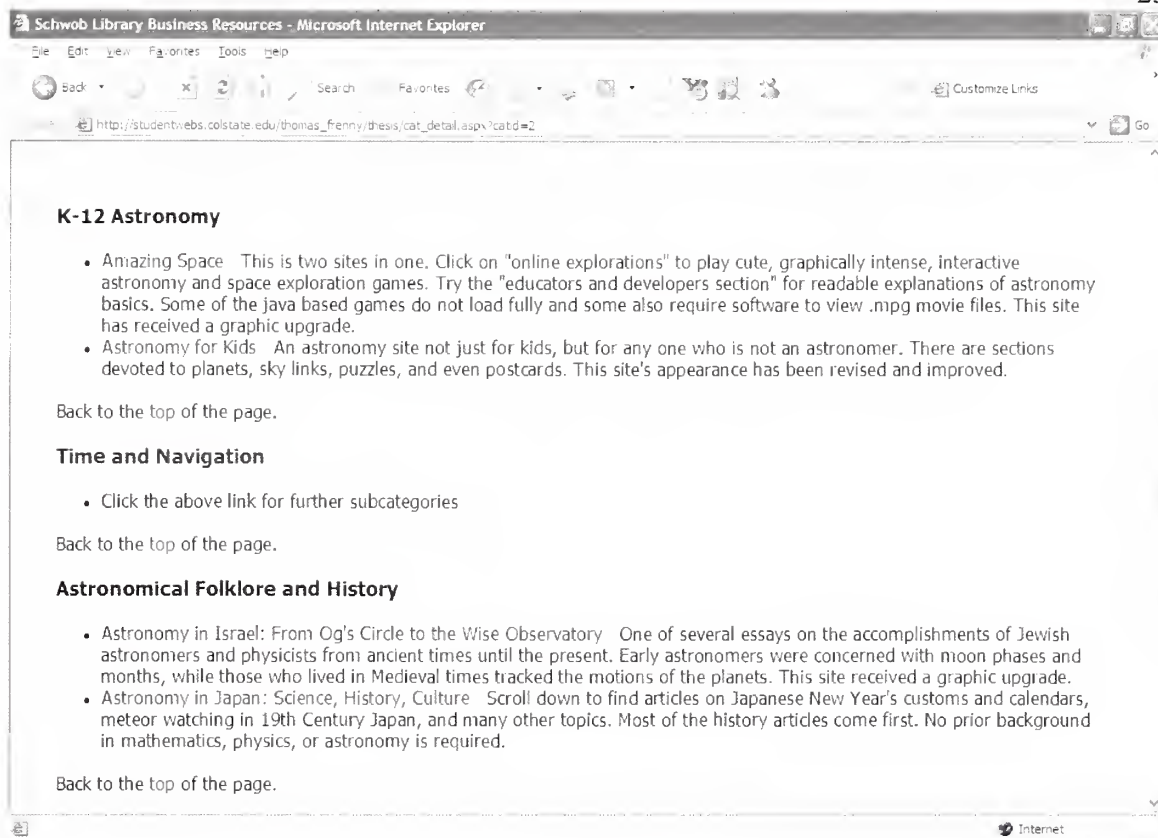


Figure 9. End User - Subcategory annotations

6.2 Searching indexes

As one can see, the Annotation Manager has its greatest advantage in the way it presents a tree-like structure of annotations belonging to various categories. But of what benefit is it to the user who already has an annotation in mind? To fulfill this need, this product must also allow for searching within the annotation indexes. As shown in Figure 10, at the bottom of each category's page, there is a Search Bar available to perform a query on all the annotations within the database.

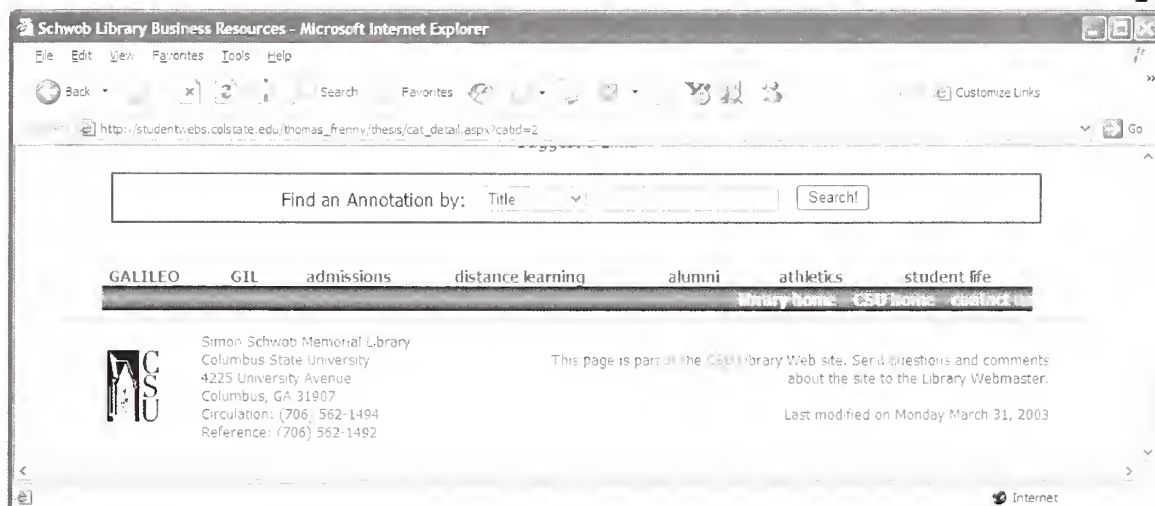


Figure 10. End User - Search Bar

The advantage to this Search feature is that the user may search by title, description, or URL. All the user has to do is select how the search should be performed, enter the keywords to search by, and select the Search button when ready. For example: if an annotation is titled "Astronomy in Japan," and the user only remembers the keyword "Japan," a query can be performed by title on keyword "Japan." If no search criteria has been entered, the error message "Invalid search query. Please try again" will appear. And if the search yielded no results, the message "Sorry! No matches were found" will display. Although the search is not case-sensitive, it does require the user to spell each word correctly. For example, the keywords "Japan" and "japan" will produce the same set of results but a misspelled word, such as "Astromomy in Japan," will show no matches.

On the contrary, if the search query does produce results (as seen in Figure 11), the results will be grouped by subcategory, and then ordered first by subcategory name (ascending), then by annotation title. Selecting a link will still open a new browser window to the destination URL.

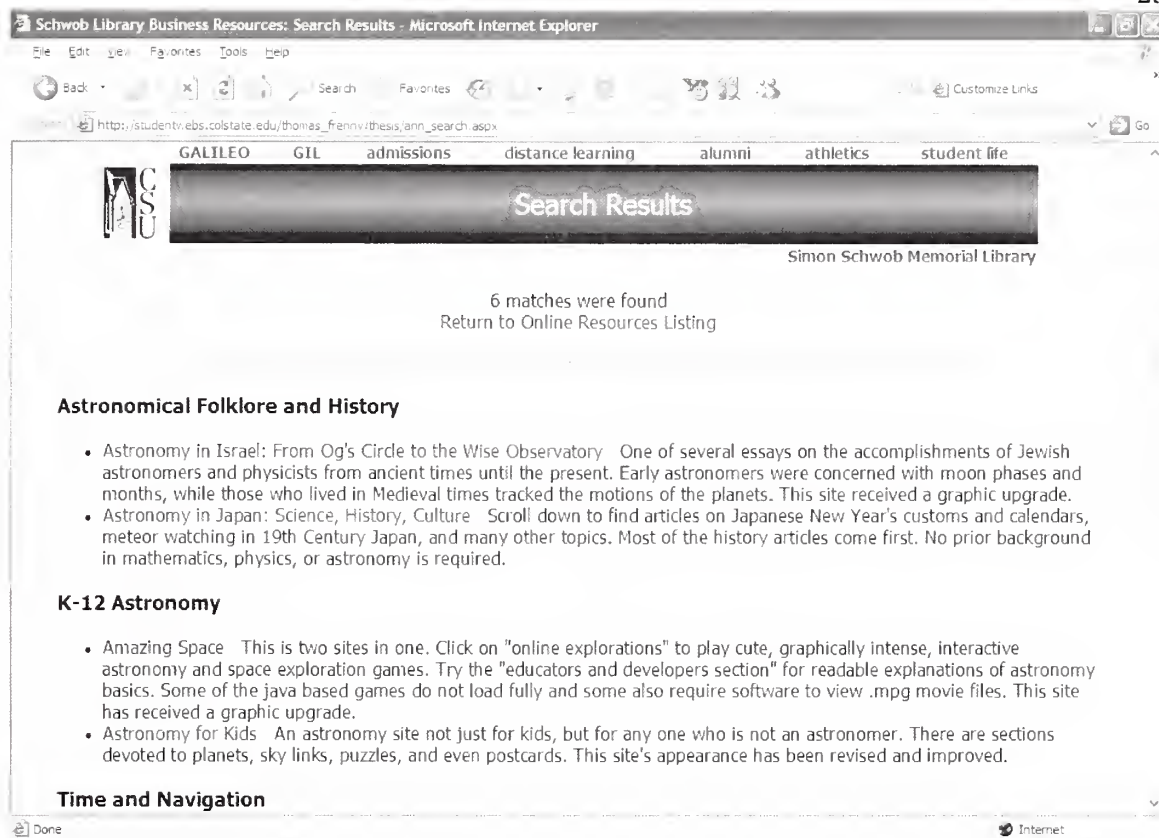


Figure 11. End User - Search Results for keyword “astro” within the Description

6.3 Suggesting a link

During the course of browsing the hierarchy of annotations, one can easily expect the end user to have ideas of his/her own for new annotations that could be added to an existing category. However, it would not be wise to allow nonadministrators to add links to the database without passing through a review process first (to be explained in Section 7.2.1). For this purpose, the end user interface allows end users to “Suggest a Link” from the bottom of every category page (as seen in Figure 12).

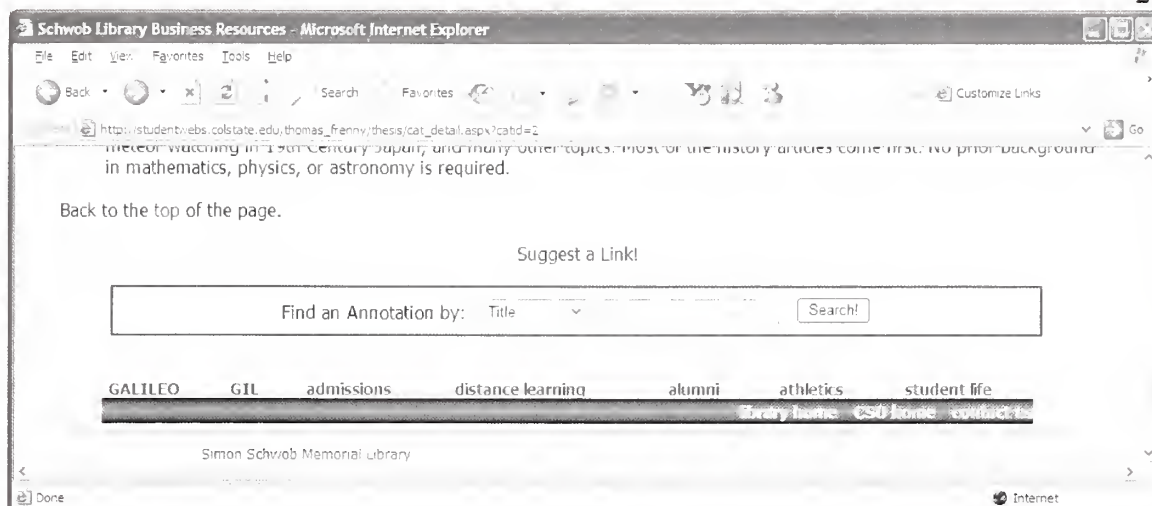


Figure 12. End User - Suggest a Link

Selecting “Suggest a Link” displays a blank form (identical to the one in Figure 13) asking for all input information regarding a new link including: Parent Category (the category under which this annotation will remain), Annotation Title, Description, and URL. Once all required information (those marked with an asterisk) have been completed, the user must select the “Add Record” button to submit the form, or the “Clear Form” button to reset the form to its original values. If an attempt is made to submit blank or invalid information (for example: an incomplete URL), the form will reject the suggestion with error messages next to the problem fields (shown below). One key feature to this service is that of the URL popup. By selecting the link labeled “Show Me,” one is able to see a popup window of the website URL submitted. This proves to be a handy feature especially when one wishes to double-check that the correct URL has been typed in. It is not necessary for the user to type in the http:// protocol provided as a default in the textbox – the popup window will add it as necessary. However, a blank URL will not produce any popup at all,


Schwob Library Business Resources: Suggest a Link - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Customize Links Go

http://studentwebs.colstate.edu/thomas_frenny/thesis/ann_suggest.asp?caid=2

GALILEO GIL admissions distance learning alumni athletics student life

 **Suggest a Link**

Simon Schwob Memorial Library

Return to Category

Parent Category: Astronomy

Annotation Title: Missing Title

Description: Missing Description

URL: (Show me) http:// Missing URL

Add Record Clear Form

Find an Annotation by: Title Search!

GALILEO GIL admissions distance learning alumni athletics student life

Library Home CSU Home Contact Us

Simon Schwob Memorial Library

Done Internet

Figure 13. End User - Attempting to Suggest a Link

7. Administrative Panel

As mentioned previously, the most attractive feature of the Annotation Manager comes with the ability to allow its online annotations to be changed ‘on the fly.’ In doing so, the product actually alleviates the librarians’ task of having to edit HTML web pages and upload them to the server. Instead, they are given a user-friendly interface that allows them to log in from anywhere with an Internet connection, and simply input information on a web form to have it dynamically added to the user interface. For this reason, the Annotation Manager has been developed with an Administrative Panel (“Admin Panel” for short) to work behind-the-scenes of the original interface. This panel will prove to be flexible through its various functions, as it manages all aspects of the online annotated bibliography.

7.1 Categories: adding, editing, deleting

The option to edit categories first begins with the ability to view them from the main menu of the Administrative Panel. Here, the administrative user may select the first “View” link either from the center panel, or the navigation bar on the left (see Figure 14)

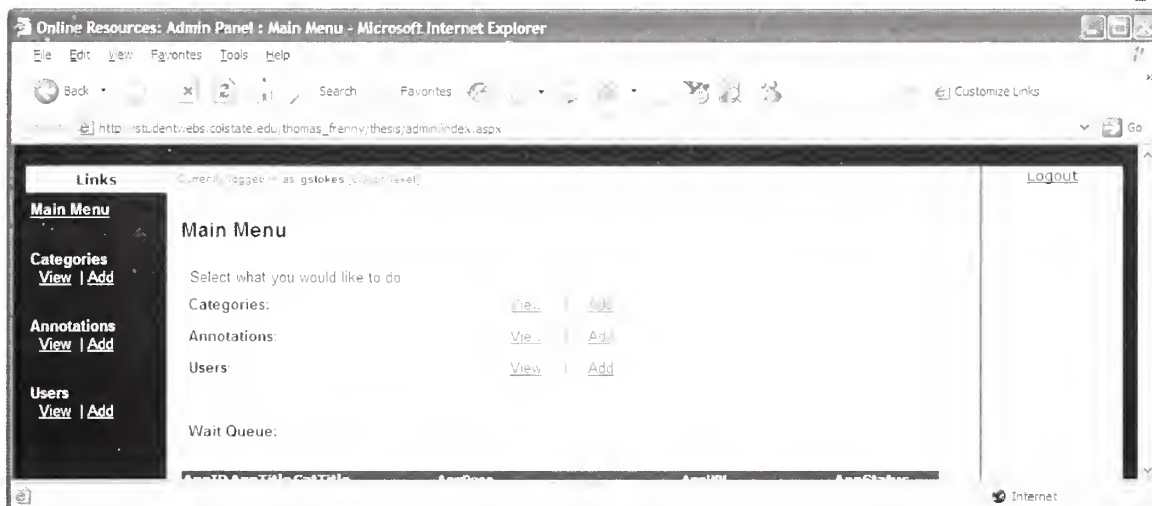


Figure 14. Admin Panel - Main Menu

Upon selecting the “View” option, the administrative user is immediately presented with a table of all available categories within the Annotation Manager’s database. The table also shows values for database fields such as: Category ID, Title, Owner’s email, Description, and Parent Category. For easier reading, the table entries are sorted by Category Title (Figure 15). However, if the administrative user wishes to do so, he/she may select any column heading to sort the results by that column, ascending (select once) or descending (select twice).

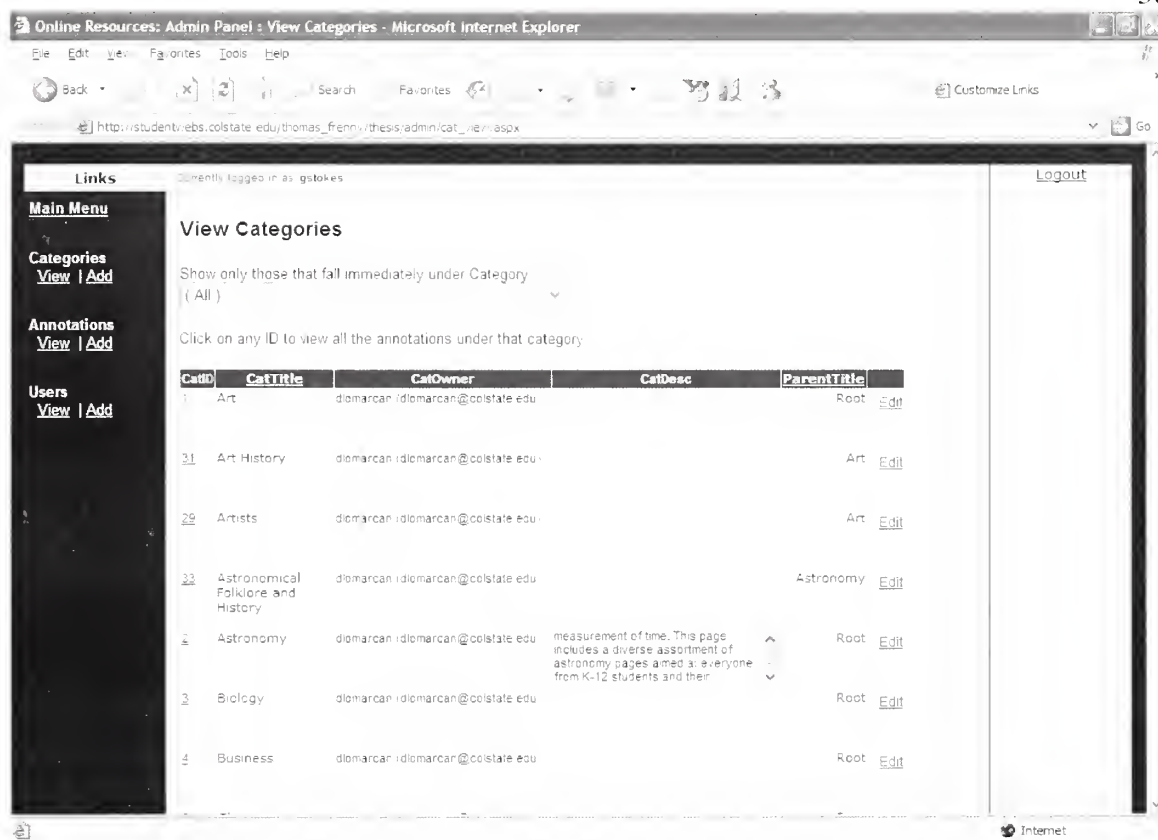


Figure 15. Admin Panel - View Categories

One additional element to this page comes in the form of a dropdown box located directly beneath the page heading. To facilitate the finding and editing of categories according to tiers, this dropdown serves as a filter to the table displayed on the same page. Upon entry, the page may display all categories within the database. However, by selecting the name of a category inside the filter (as done so in Figure 16), the page will refresh automatically and only show those categories that branch directly from (act as children to) the selected category. One can verify this by observing the Parent Category's title on each result listing – it should match the category name that had originally been selected in the filter.

Online Resources: Admin Panel : View Categories - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Customize Links Go

http://studentwebs.colstate.edu/thomas_frenn/thesis/admin/cat_view.asp

Links: [Home](#) | [Logout](#) | [mas_cpsc](#)

Main Menu

Categories
[View](#) | [Add](#)

Annotations
[View](#) | [Add](#)

Users
[View](#) | [Add](#)

View Categories

Show only those that fall immediately under Category
Astronomy

Click on any ID to view all the annotations under that category

CatID	CatTitle	CatOwner	CatDesc	ParentTitle
1	Astronomical Folklore and History	dlomarcan (dlomarcan@colstate.edu)		Astronomy Edit
2	K-12 Astronomy	dlomarcan (dlomarcan@colstate.edu)		Astronomy Edit
3	Time and Navigation	dlomarcan (dlomarcan@colstate.edu)		Astronomy Edit

Done Internet

Figure 16. Admin Panel - View Categories (filtered)

The “View Categories” page also features a direct link to the “View Annotations” page from the displayed list of categories. Note that every Category ID is a hyperlink to the annotations page. By selecting a particular Category ID, the administrative user is immediately directed to a list of all annotations within the database that belong to that category (as seen in Figure 17). From there, the administrative user may choose to update or delete any annotation.

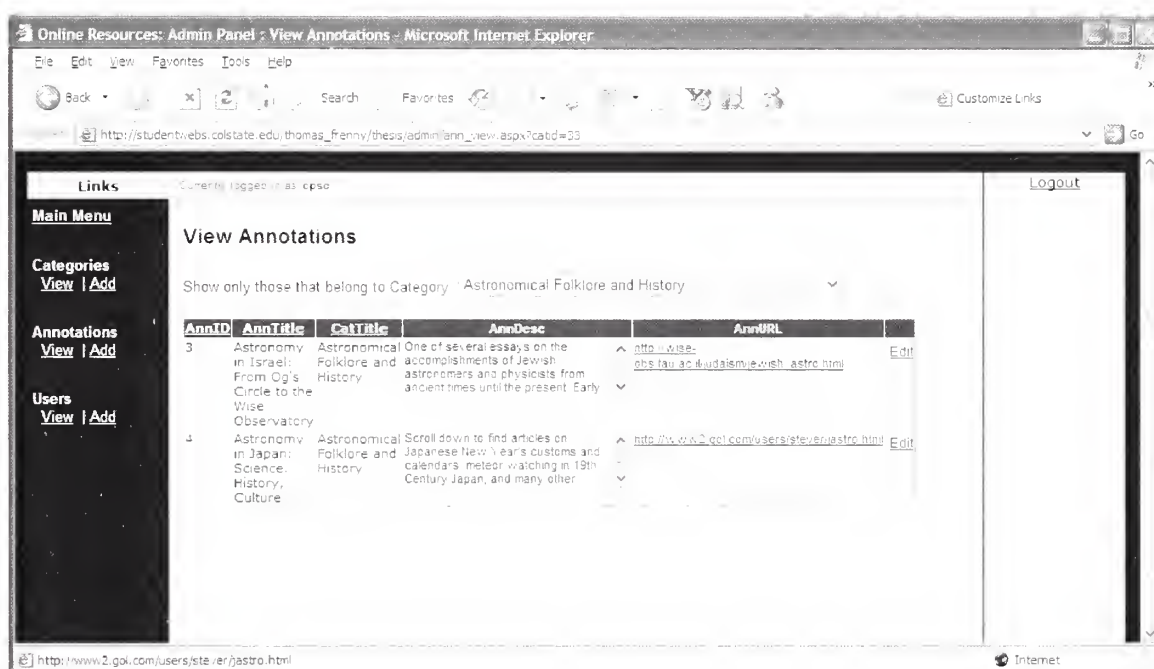


Figure 17. Admin Panel - View Categories and their Annotations

The display table of categories shown in Figure 15 has one additional column to the right containing links titled “Edit” beside each category name. Selecting this link will display all database information within a particular category, including its Category ID, Title, Owner’s username, Owner’s contact email, Description, and name of Parent Category within the taxonomy.



Online Resources: Admin Panel : Edit a Category - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Customize Links

http://studentwebs.colstate.edu/thomas_frenny/thesis/admin/cat_edit.aspx?catid=33

Currently logged in as: cpso Logout

Links

Main Menu

Categories
View | Add

Annotations
View | Add

Users
View | Add

Edit a Category

Category ID: 33

Title: Astronomical Folklore and History

Owner: dlomarcan

Owner's Email: dlomarcan@colstate.edu

Description:

Parent Category: Astronomy

Save Delete Cancel

Done Internet

Figure 18. Admin Panel - Edit a Category

As indicated by the red asterisks, all fields on this form are required except the Category description. If any field value is blank or invalid (such as an email address in the wrong format), the server will not accept the submission and will display reject reasons such as “Missing Title” or “Invalid Owner’s Email.” However, if the submission succeeded (via selecting the “Save” button), the message “Record updated” will display below the Save/Delete/Cancel buttons as confirmation.

The “Cancel” button on the page is meant to make no changes to the displayed category, but instead to return the administrative user to the list of all categories in the previous page. The “Delete” button, however, is intended to delete the entire category, as well as any children (or grandchildren) categories beneath. Additionally, any annotation from the table tblAnnotations that belongs to any deleted category will also be erased, so as to preserve the structure and integrity of the data as a whole. Before any category is

deleted, the administrative user will be warned of the implications of deleting this category (see Figure 19).

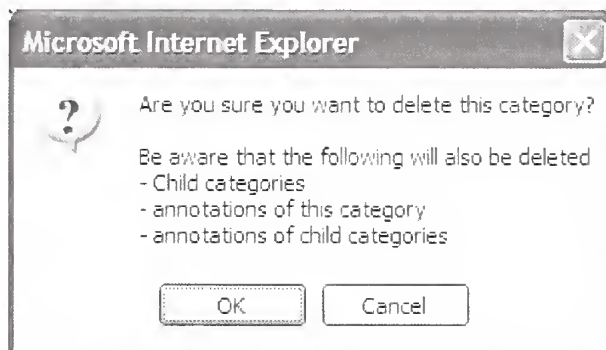


Figure 19. Admin Panel - Delete a Category

It is important to observe that the ability to update a category's "parent" allows great flexibility in modifying the overall tree-hierarchy of categories. By changing the name of the parent category (despite the current tier), the Annotation Manager allows the administrative user to move entire subtrees to anywhere within the overall structure—even to the root or under another leaf!

i.e. Science

Biology

Physiology

Anatomy

Human Anatomy

can be restructured by changing the parent category of "Anatomy" from "Physiology" to "Science." Thus resulting in the below,

i.e. Science

Biology

Physiology

Anatomy

Human Anatomy

With this feature in place, the Annotation Manager will prove to be very useful to those who wish to restructure categories as needed, without having to delete and recreate entire subtrees and their associated annotations once again.

To add a category, the administrative user must select the first “Add” link from either the navigation bar on the left or the Main Menu screen. This action results in a blank form, as seen in Figure 20, ready to accept all the details associated with a brand new category. Similar to the page to edit a category, all required fields are marked with a red asterisk and any attempt to create a category (via the “Add Record” button) with invalid information will be declined. Similarly, if a category has been successfully added, a confirmation message will be displayed. The “Clear Form” button is helpful if the administrative user wishes to start over with the form. There will be no warning message immediately upon selecting this button – all form fields will be cleared out right away.

Online Resources: Admin Panel : Add a Category - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Customize Links Go

http://studentwebs.colstate.edu/thomas_frenny/thesis/admin/cat_add.aspx

Links

Main Menu

Categories
[View](#) | [Add](#)

Annotations
[View](#) | [Add](#)

Users
[View](#) | [Add](#)

Add a Category

Category Title:

Owner:

Owner's Email:

Description:

Parent Category:

[Logout](#)

Internet

Figure 20. Admin Panel - Add a Category

7.2 Annotations: adding, editing, deleting

Along with the ability to add, edit, and delete categories, the Annotation Manager accomplishes its main purpose by allowing administrative users to edit the annotations displayed back in the end user's interface. To begin, the administrative user selects the second "View" link either from the Main Menu (see Figure 14) or via the navigation bar on the left. This results in a table listing all the annotation entries within the project database (as shown in Figure 21).

Online Resources: Admin Panel - View Annotations - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back X Search Favorites Customize Links Go

http://student.webs.colostate.edu/thomas_frenny/thesis/admin/ann_view.aspx

Links

Currently logged in as: cpse Logout

View Annotations

Show only those that belong to Category: (All)

AnnID	AnnTitle	CatTitle	AnnDesc	AnnURL	Edit
1	Amazing Space	K-12 Astronomy	This is two sites in one. Click on online explorations to play cute, graphically intense, interactive astronomy and space exploration	http://amazon-space.etsci.edu/	Edit
2	Astronomy for Kids	K-12 Astronomy	An astronomy site not just for kids, but for any one who is not an astronomer. There are sections devoted to planets, sky lines, puzzles,	http://www.dustbunny.com/afk/	Edit
3	Astronomy in Israel: From Og's Circle to the Wise Observatory	Astronomical Folklore and History	One of several essays on the accomplishments of Jewish astronomers and physicists from ancient times until the present. Early	http://www-obs.tau.ac.il/judaism/ewish_astro.html	Edit
4	Astronomy in Japan: Science, History, Culture	Astronomical Folklore and History	Scroll down to find articles on Japanese New Year's customs and calendars, meteor watching in 19th Century Japan, and many other	http://www.v2.gol.com/users/steverastro.html	Edit
5	The Astrolabe	Time and Navigation	The astrolabe is a very ancient astronomical computer for solving problems relating to time and the position of the Sun and stars in the	http://astrolabes.org/astrolab.htm	Edit
6	Astronomical Time and Time	Time and Navigation	A long essay about a variety of aspects of keeping and measuring time by the sun, moon, and stars. This site covers universal time, Greenwich	http://www.mga.mhn.ca/Scholar/times.html	Edit
7	Christopher Columbus	Navigation Explorers	A site about the famous explorer	http://www.sacklunch.net/bicq/achv/CiChristopherColumbus.html	Edit

Internet

Figure 21. Admin Panel - View Annotations

Within this table, one can see the annotation's ID, its category, URL address, and description text, as stored in the project database. Notice how the annotation URLs are links themselves. This feature allows any link to be selected and opened in a new

browser window rather than drifting away from the original administrative panel. And, although the annotations may originally be sorted by their annotation IDs, the entire table can easily be re-sorted by selecting the desired column heading, once for ascending, and twice for descending.

Acknowledging the fact that administrative users most likely already know which category to look in for a particular annotation to edit, the dropdown filter (previously mentioned in the “View Categories” page) has also been implemented here. Upon selection of a specific category to filter by, the page will automatically reload and only show those annotations asked to be seen (as shown in Figure 22). This feature greatly simplifies the process of searching for a single annotation among dozens belonging to various categories. Once again, this filter can be verified against the Category title column displayed.

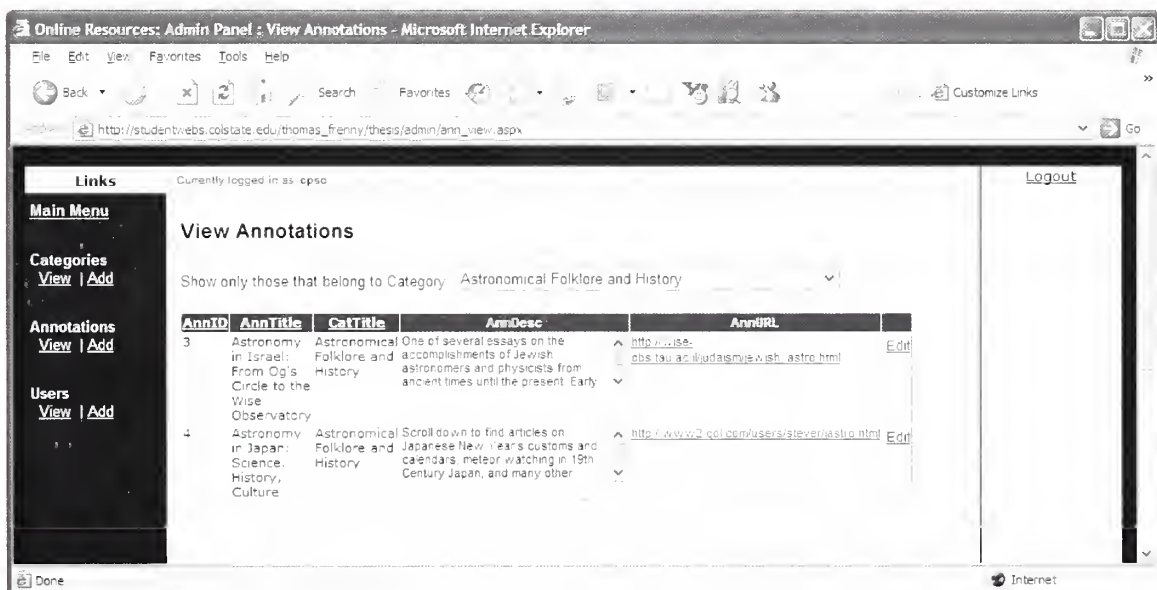


Figure 22. Admin Panel - View Annotations (filtered)

Observe the “Edit” link column placed to the far right of each annotation entry. Similar to the one found in the “View Categories” page, the administrative user may

select a link next to any annotation. Doing so will display the "Edit an Annotation" page (see Figure 23).

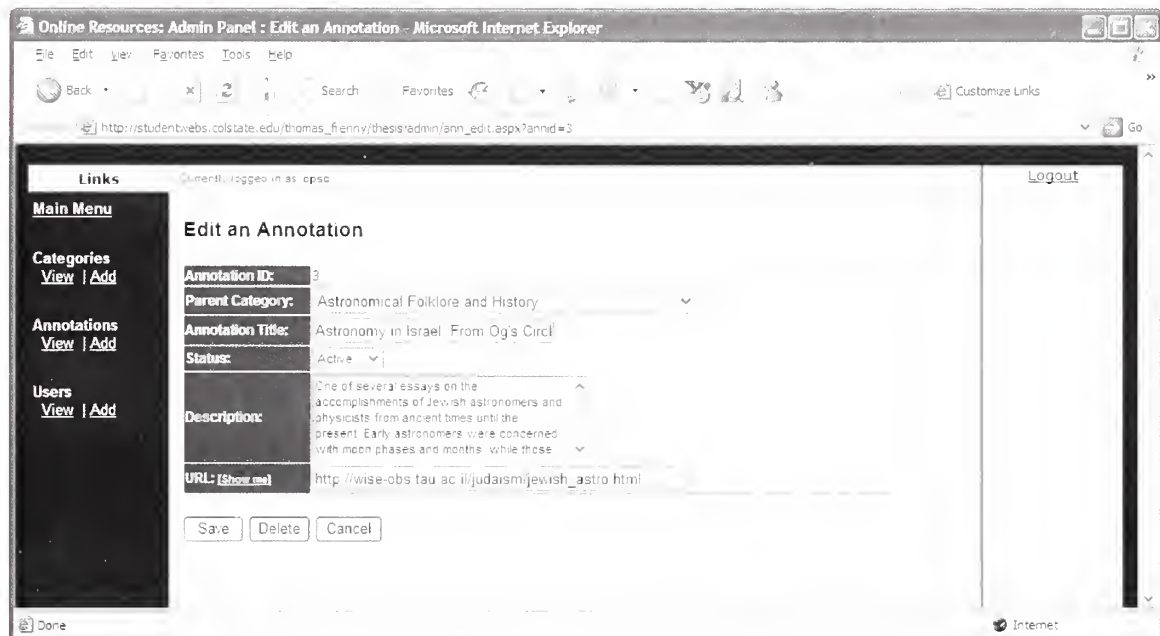


Figure 23. Admin Panel - Edit an Annotation

Although the Annotation ID field may not be edited (it is an auto-generated number), the administrative user may update the annotation's category, title, status (to be explained later in Section 7.2.1), description, and/or URL address. As clearly marked by the red asterisks, every field on this form requires input data. If an attempt is made to submit an update to an annotation (via the "Save" button) with blank fields, the page will cancel the transaction and reload itself displaying error messages (such as "Missing Title") to the right of each problem field. Meanwhile, a successful submission will return a positive confirmation. To minimize the risk of inputting an invalid URL, it would be better if the administrative user could select the "Show me" link and verify that a valid destination indeed appears in the popup browser. And similar to that of editing

categories, the “Cancel” button will return the administrative user to the previous page, whereas “Delete” will delete the annotation after first issuing a warning message.

Also, observe how the ability to update an annotation’s category allows it to be easily moved around within the tree hierarchy. For example: an annotation to the Great Pyramids of Egypt could be moved from under the “Middle East” category to that of “Art History” with a simple dropdown change. This eliminates the need to create a new annotation underneath “Art History,” copy the contents from the existing annotation to the new one, and then delete the old one under “Middle East.” However, one limitation to this is that each annotation can *only* belong to a single a category. Thus with the previous example, the Great Pyramids could not be classified as belonging to both categories simultaneously.

Adding an annotation is similar to how one edits an annotation. The administrative user must select the second “Add” link from either the navigation bar on the left or the Main Menu screen. This produces a blank form, as seen in Figure 24, ready for user input on a brand new annotation. Similar to the page to edit such an annotation, all fields are marked with a red asterisk because all are required, and any attempt to create an annotation (via the “Add Record” button) with blank information will be declined. Similarly, if an annotation has been successfully added, a confirmation message will be displayed. The “Clear Form” button once again resets the entire form.

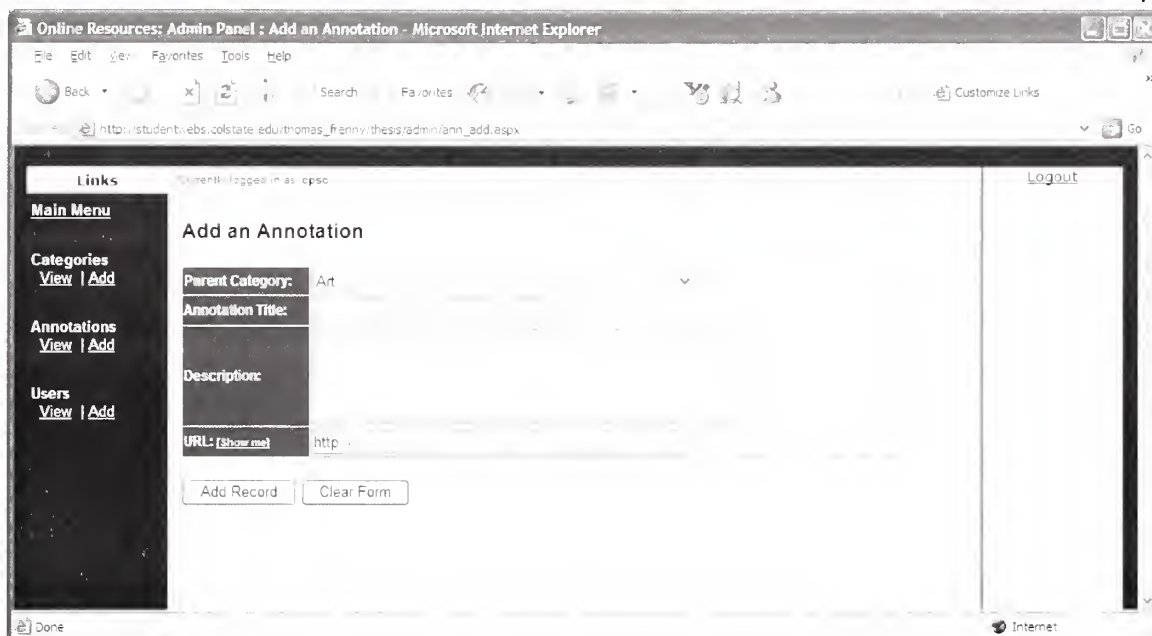


Figure 24. Admin Panel - Add an Annotation

7.2.1 Approval of suggestion links

Although the administrative panel provides an easy way to add annotations through the “Add an Annotation” page, there exists another gateway through which annotations may enter the project database. This is possible through the “Suggest a Link” option from the end user interface, as mentioned in Section 6.3. This provides a method for end users to suggest new links to be added to the Annotation Manager, and to have them added to the project database. However, these links must first be approved by an administrative user before they are displayed in the end user’s interface. This is because a suggested annotation is assigned the “Wait” Status by default. Understanding that an annotation can have one of the three possible states at any time:-- wait, active, or inactive--is important. Those annotations that have a status of “Wait” or “Inactive” are not displayed on the end user interface because they are not “Active.” A suggested link may have a valid URL and even be of high value to other users. However, until an administrative

user manually changes the annotation's status to "Active," it is not considered available for general use.

For this reason, the administrative panel has been enhanced to include the ability to approve any and/or all suggestions in the "Wait" or "Inactive" queue. This queue of suggestions first appears on the Main Menu screen of the admin panel (as seen in Figure 25) when the administrative user logs in.

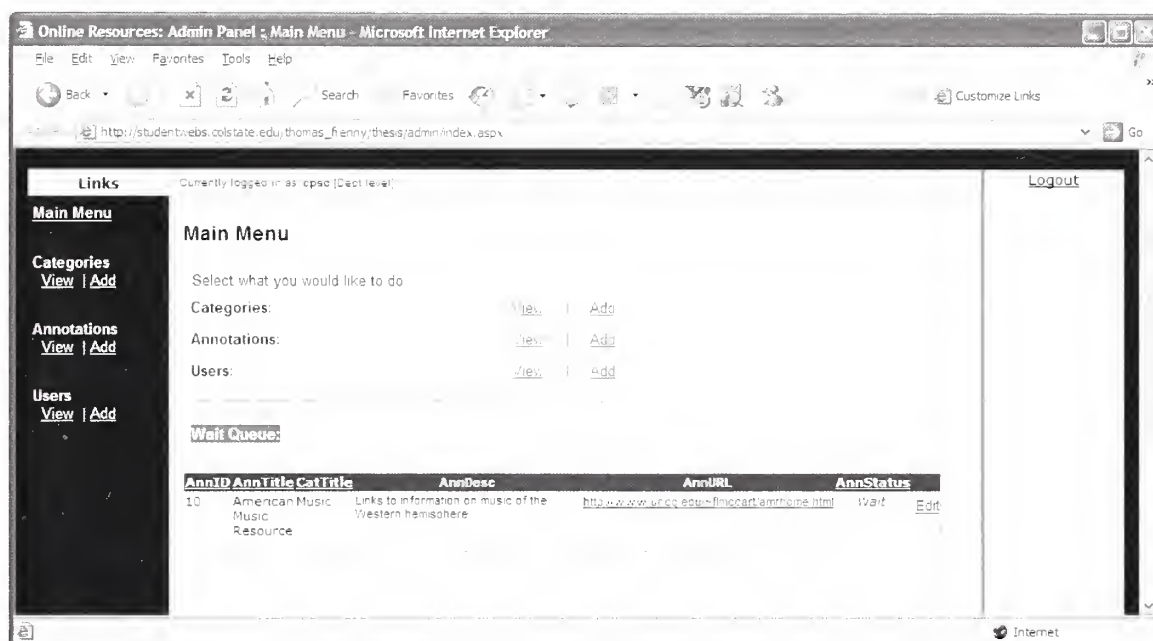


Figure 25. Admin Panel - Wait Queue

Similar to the "View Annotations" page, this queue shows the details of annotations waiting to be approved and those that have been detected of having invalid URLs. The displayed table shows information on each annotation such as its ID, title, category, description, URL, and status. Sorting by individual columns is available through annotation ID, title, category, or status. Additionally, the "Edit" link column to the far right that looks identical to the "Edit" links from the "View Annotations" page. This is because both links direct the administrative user to the same "Edit an Annotation"

page. Upon reaching this page, the administrative user may manually change the status of the annotation from “Wait” or “Inactive” to “Active” by using the Status dropdown box (as shown in Figure 26). Before doing so, the administrative user can make any changes necessary to the annotation itself using the Edit form. These changes can be minor, such as a correction in the URL address, category, or description. Additionally, the administrative user can delete the entire annotation altogether using the “Delete” button, which may be needed if an annotation’s URL no longer exists.

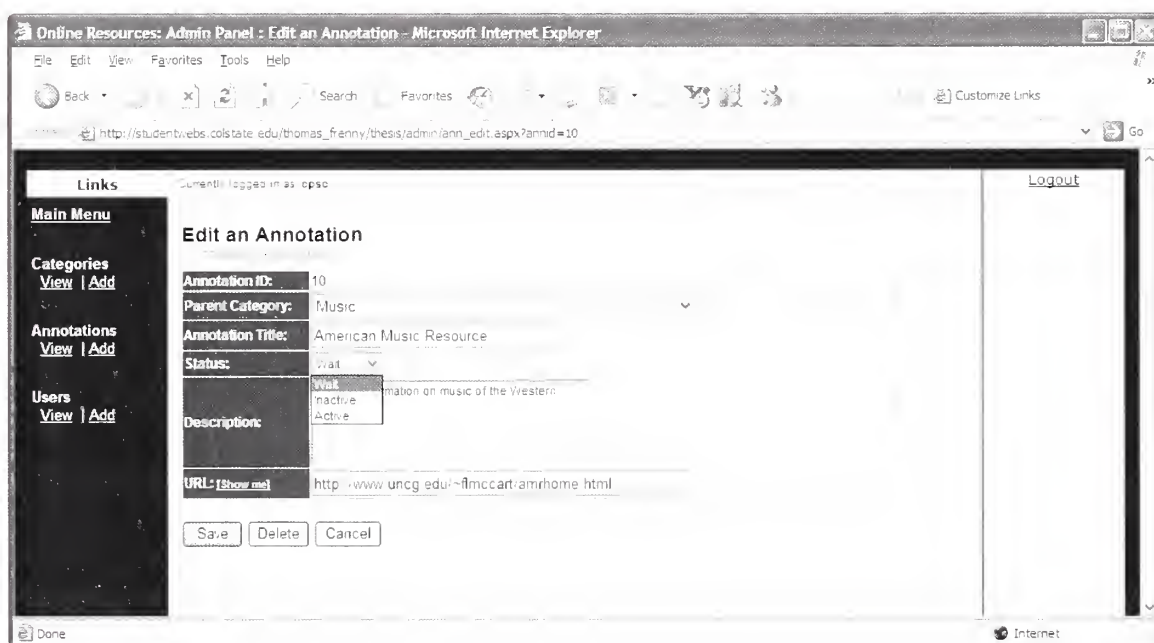


Figure 26. Admin Panel - Change Wait Queue Status

Once the annotation is changed to an “Active” status, it will no longer appear in the Wait queue of the administrative panel’s main menu. Concurrently, it will begin to appear on the end user’s interface unless its status changes once again, if it contains a dead link. Any further modifications to the status of an annotation can be done normally through the “View Annotations” page.

7.3 Users: adding, editing, deleting

So far the administrative panel has proven to have many features to allow an administrator great flexibility in managing the contents of the annotations database. Hence, the panel should not be limited in access to a single individual responsible for maintaining every category within the project database. For this reason, the panel allows the creation of various administrative “users”; individuals with userIDs and passwords that allow them to enter the administrative panel under different access levels (see Section 4.3).

To begin, an administrative user who successfully logs into the Admin Panel may or may not see a link to View and Add Users depending on his/her access level. For example, an individual with “Dept” level of access will only see links to view and modify categories and annotations on the Main Menu (see Figure 27). Meanwhile, a Level 1 administrator will be able to see links to categories, annotations, and users (see Figure 28). . This is because only an individual with Level 1 access has the ability to add or modify users as needed.

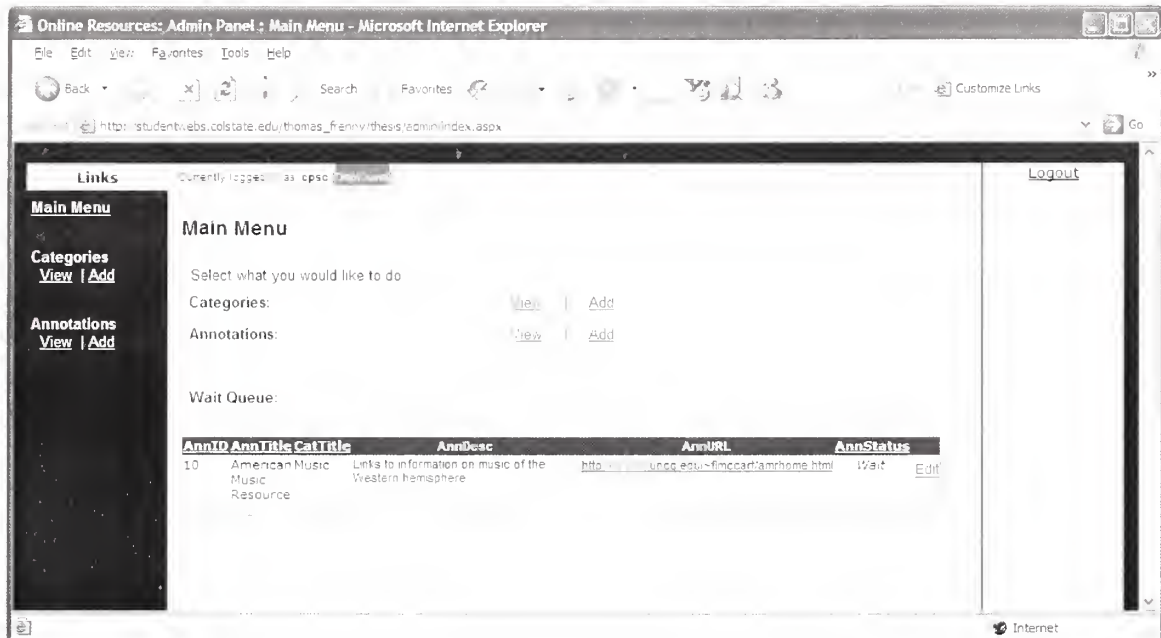


Figure 27. Admin Panel - Main Menu without Admin rights

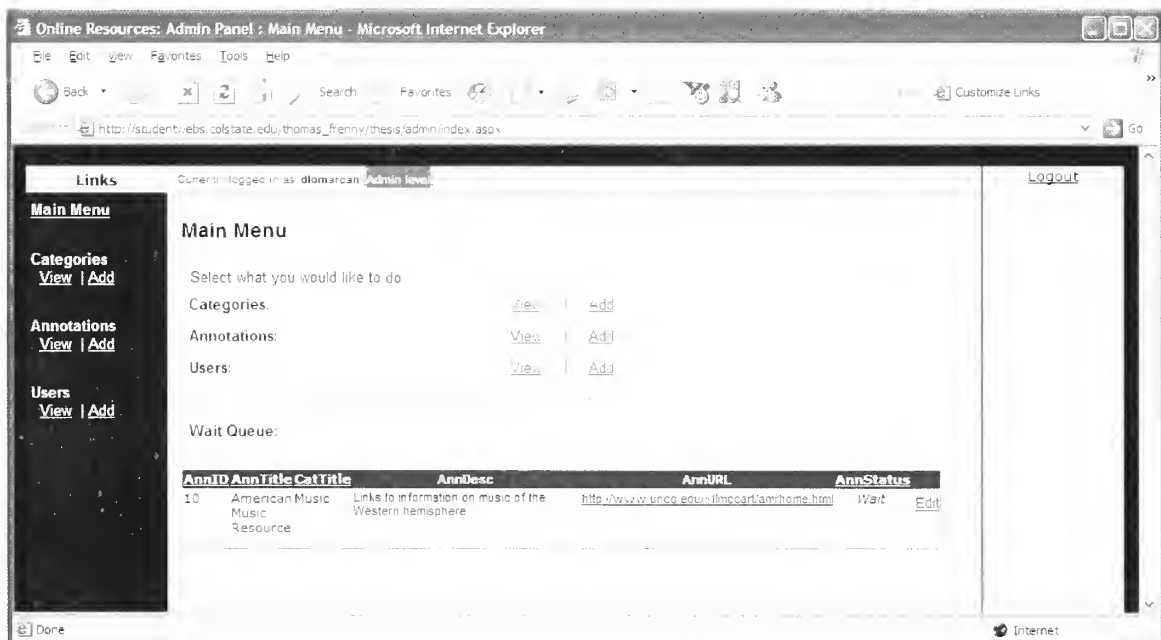


Figure 28. Admin Panel - Main Menu with Admin rights

At this point, the administrator may select the “View” link to see a listing of all existing administrative users within the project database. As Figure 29 shows, this table lists every userID, each level of access, and email address. Similar to the “View

Annotations” and “View Categories” pages, one may select any column to sort by that column’s contents if needed.

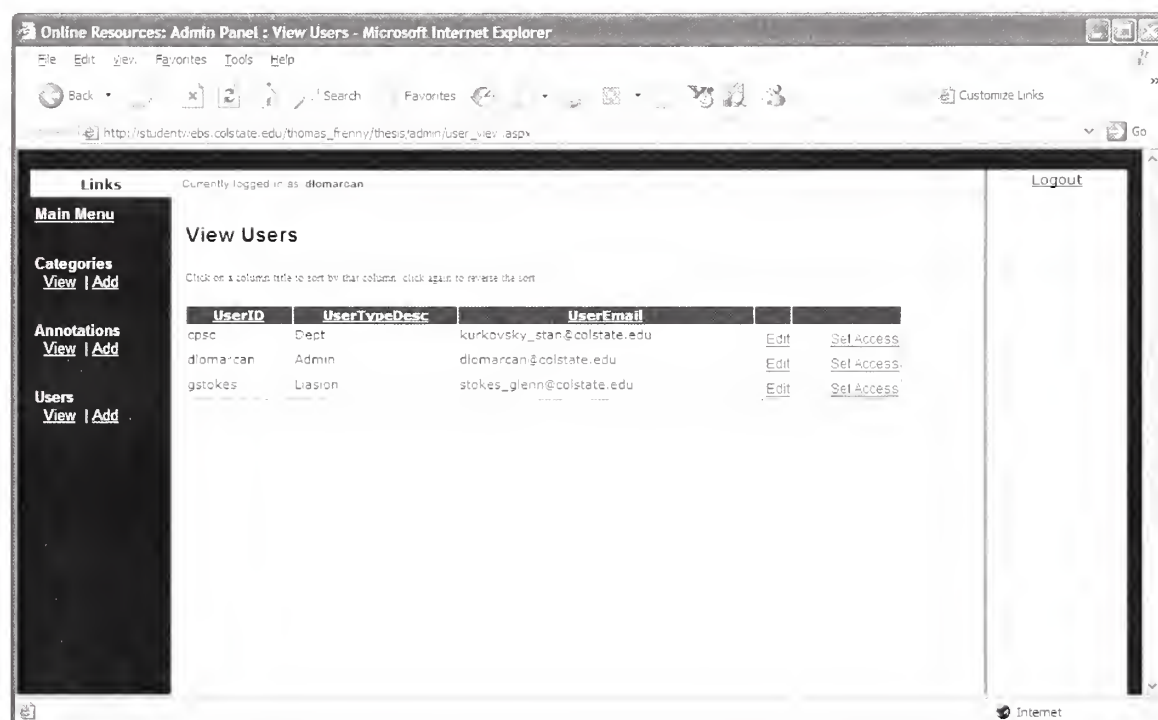


Figure 29. Admin Panel - View Users

In addition to the above-mentioned fields, the table also includes a fourth column providing an “Edit” link per administrative user. Selecting this link will bring the administrator to the “Edit a User” form (similar to that shown in Figure 30), in which every field will be filled with the selected administrative user’s information once again. Although the UserID is not an updatable field (it must remain unique within the database), the administrator may choose to change the selected administrative user’s password, his/her level of access, and/or contact email address. One may also choose to delete the administrative user entirely (via the “Delete” button) or return to the previous page (“Cancel” button). As indicated once again by the red asterisks, every field on this form is required, and will be validated upon form submission. For example, if the

password is not retyped correctly in the “Retype Password” box, the message “Password mismatch” will appear next to the respective textbox as the reason why the form submission was rejected. Likewise, if the email address is not of valid format (i.e. username@domain.ext), the message “Invalid Email” will appear.

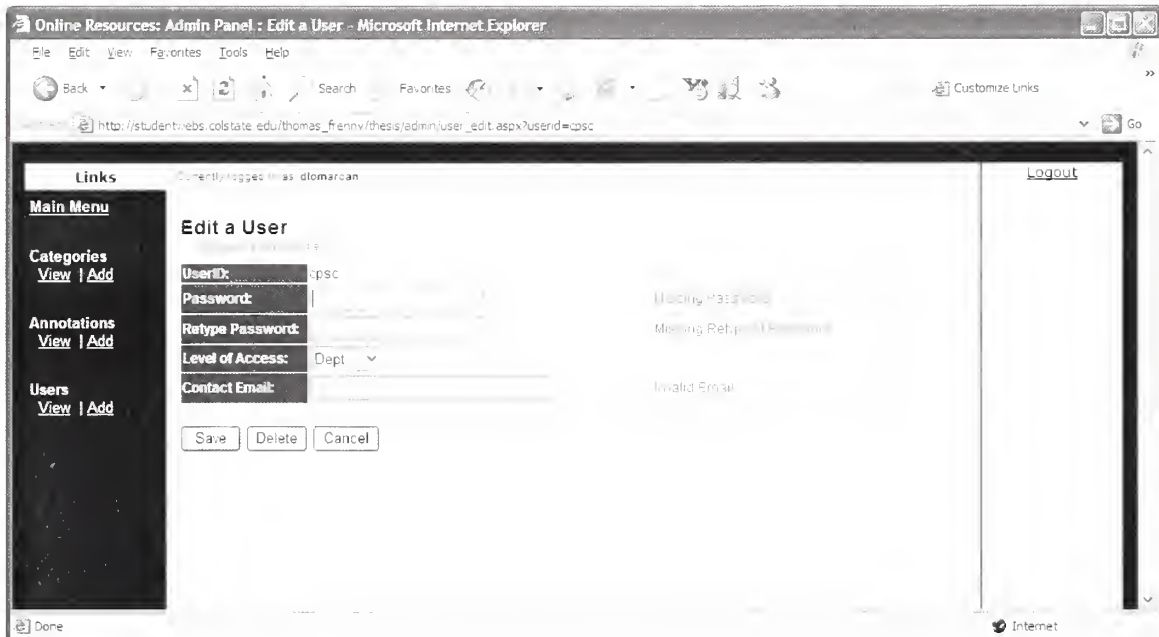


Figure 30. Admin Panel - Edit a User

Similar to the process of editing a user, an administrator with Level 1 access may also add an administrative User through the same “hidden” link on the Main Menu or left navigation bar. Selecting the “Add” link will bring the administrator to a blank form (shown in Figure 31). Every field is required for each new administrative user, especially the UserID, which must be unique throughout the project database. If an attempt is made to add a new administrative user with the same UserID as an existing user, the submission will fail with the reject reason “UserID already exists. Record not added.” Otherwise, if all fields are considered valid, the confirmation message “Record added” will display to show a successful submission.

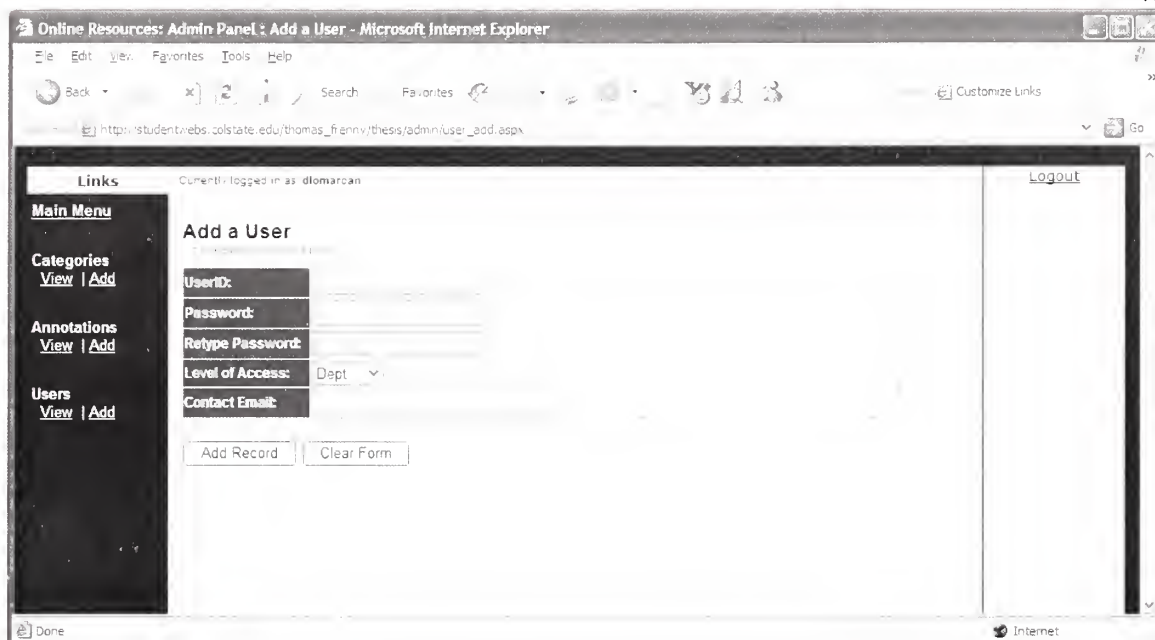


Figure 31. Admin Panel - Add a User

7.3.1 Defining user access by category

The table that displays all administrative users currently within the Annotation Manager also has a column to the far right labeled “Set Access.” Selecting this link will display a page similar to the one shown in Figure 32, which is meant to define an administrative user’s access specifically by category. Upon entering this page, the administrator will be presented with a series of checkboxes per category in a tabular format. By checking-on or checking-off a checkbox assigned to individual categories, the administrator is able to limit each administrative user’s access to specific areas. For example: an individual with “Liaison” access may need to manage multiple (unrelated) areas such as “Mathematics” and “Computer Science.” On the other hand, an administrative user with “Dept” level access may only need to manage the “Theater” category. This tool allows a mix-and-match combination in setting administrative access to various categories. A Level 1 administrator has the ability to modify all categories by default. However, the “All”

checkbox is also available to facilitate the checking on/off of multiple checkboxes. Selecting “All” will automatically refresh the page and select all checkboxes, while unselecting it will unselect all checkboxes. Once all changes necessary have been made, the administrator may select the “Save Changes” button to set the administrative user’s new areas of access, or the “Cancel” button to make no changes to his/her existing access.

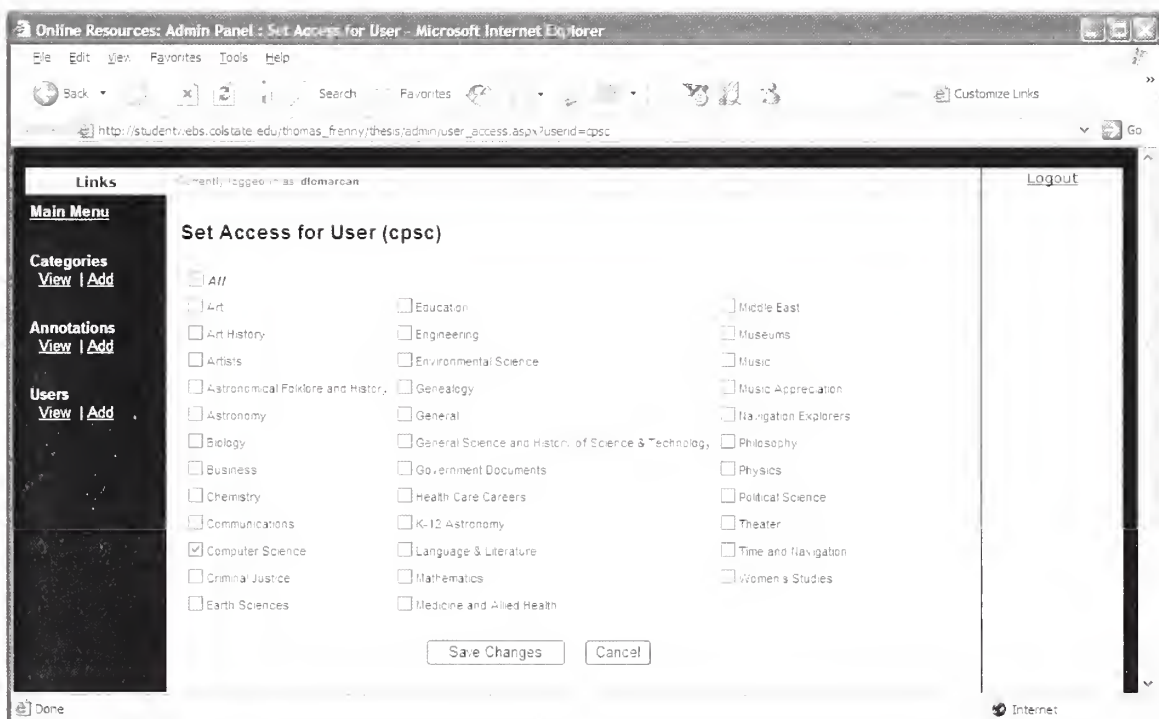


Figure 32. Admin Panel - Set User Access

7.4 Login/Logout procedure

The End User interface of the Annotation Manager is available to all users, whereas the Administrative Panel is only available to those administrative users within the project database. To login to the panel, an administrative user must first type in his/her UserID and password into the textboxes provided on the login page (see Figure 33). If the

submitted UserID-password combination cannot be matched to an existing administrative user within the project database, the login will fail with the reason “Invalid UserID or password.”

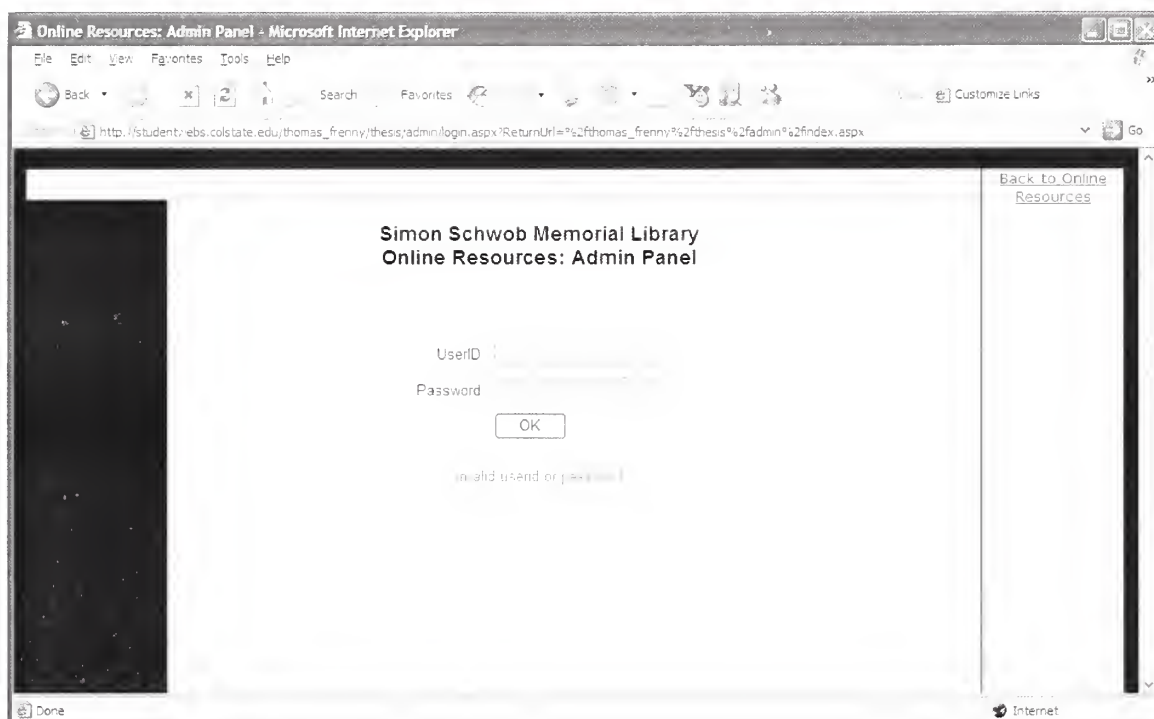


Figure 33. Admin Panel - Login

However if the login is successful, the Administrative Panel will display the Main Menu as seen in Figure 34. Additionally, the opening page will show the message “Currently logged in as :” along with the current administrative user’s UserID and access level for verification purposes. Note the “Logout” link in the upper right corner; selecting this link will successfully logout the current administrative user and return him/her to the Login page. It is also important to remember that any unauthorized (without login) attempt to access any page within the Administrative Panel, will first redirect the user to the main Login page awaiting a valid UserID and password.

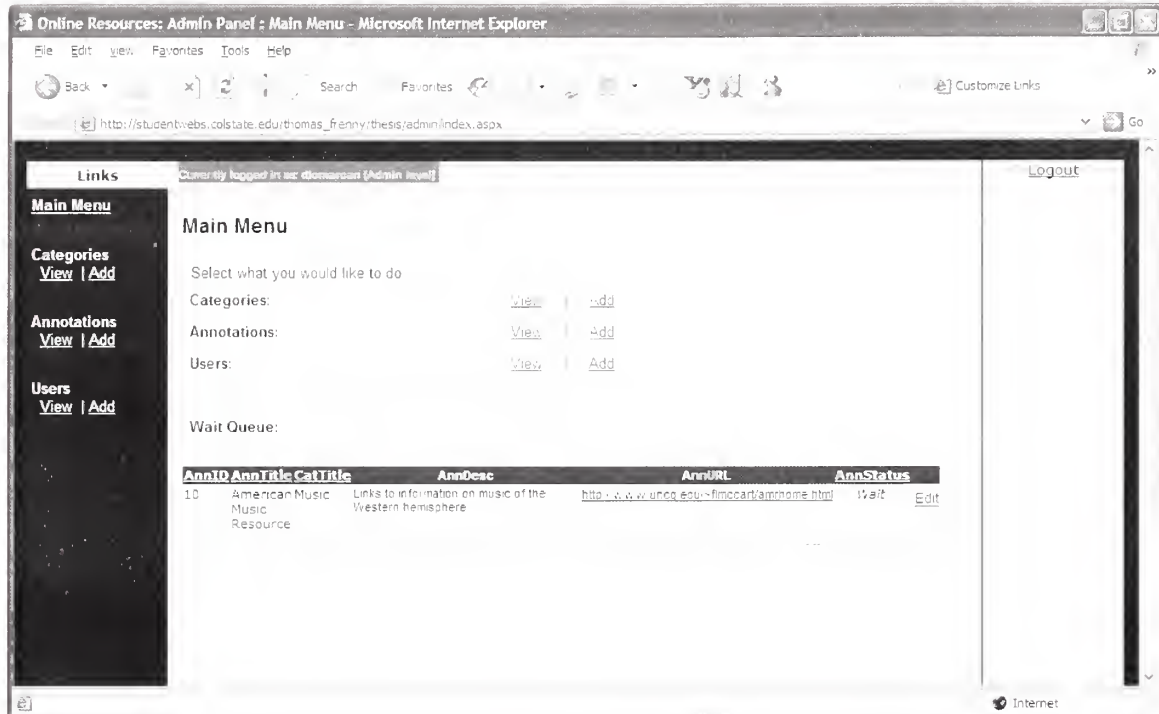
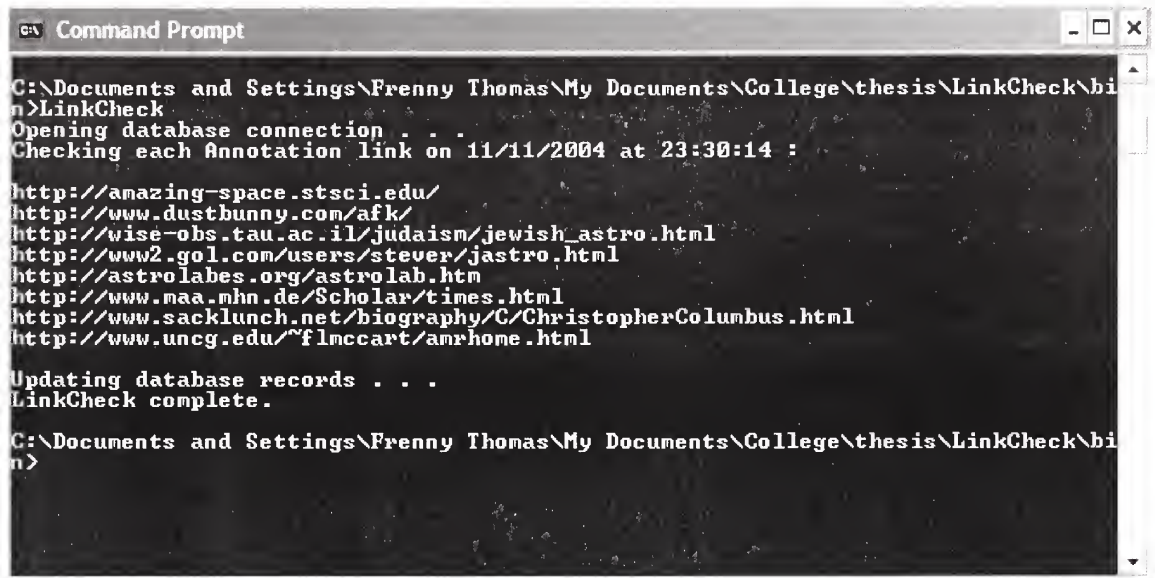


Figure 34. Admin Panel - Login Successful

8. LinkCheck

The Annotation Manager provides much needed automated assistance to those administrative users who wish to update the list of annotated links stored within the database. Such a need will especially emerge when a link becomes inactive or “dead” (if it no longer points to a valid destination page), thereby causing an administrator to make the necessary corrections within the database. Yet many websites are changing on a daily basis: links become inactive or webpage content is added or removed. It is not realistic to expect an administrator to manually visit each link within the project database periodically to check for existence and updates. Such a task would become exponentially time-consuming as the list of annotation links grows. For this reason, the Annotation Manager has been extended to a utility called LinkCheck – a batch application that runs periodically to validate each link within the database. As long as it has been successfully installed on the server, scheduled as a periodic (weekly) task, and knows where to find the database of annotations, LinkCheck will provide valuable information to the end users of the Annotation Manager.

The program can be executed directly from the Command Prompt using the keyword “LinkCheck.” However, to execute the program, either the Windows environmental PATH variable must be updated with the directory location of the LinkCheck.exe file or the user must use DOS commands to change the current directory to the directory where the LinkCheck.exe is located. When the program is executed with no parameters specified (see below for a list of available parameters), the output results will look similar to Figure 35, with a list of links that were validated in the process. Further instructions on how to install this product are included in the Appendix.



```

C:\Documents and Settings\Frenny Thomas\My Documents\College\thesis\LinkCheck\bin>LinkCheck
Opening database connection . . .
Checking each Annotation link on 11/11/2004 at 23:30:14 :
http://amazing-space.stsci.edu/
http://www.dustbunny.com/afk/
http://wise-obs.tau.ac.il/judaism/jewish_astro.html
http://www2.gol.com/users/steve/jastro.html
http://astrolabes.org/astrolab.htm
http://www.maa.mhn.de/Scholar/tines.html
http://www.sacklunch.net/biography/C/ChristopherColumbus.html
http://www.uncg.edu/~flmccart/amrhome.html

Updating database records . . .
LinkCheck complete.

C:\Documents and Settings\Frenny Thomas\My Documents\College\thesis\LinkCheck\bin>

```

Figure 35. LinkCheck - standard output

8.1 Functionality

The LinkCheck is unique because it performs two primary functions in its link validation:

1. It checks whether each link is still an active URL.
2. If the link is still active, LinkCheck looks for any content updates on the destination webpage.

If a link is found dead, the message “– Alert! Inactive URL detected” will appear on the console window beneath the link. The program will then retrieve the email address of the owner of that URL’s category. Using all the gathered pieces of information, LinkCheck will next send out an email (via the local mail server) to the category owner alerting him/her of such a dead link in this category. Upon receiving this alert, the owner may log into the Administrative Panel and edit/delete the annotation as necessary.

If a link is still active, its current webpage content length is compared to the content length stored in the database from the previous run. This is done to detect any changes that have been recently made to the webpage and flag such updates accordingly within the database. If updates are detected within this process, the new content length will be saved and the Annotation Manager's user interface will display the "Update" icon next to the annotation until LinkCheck runs again. Likewise, if a link is not active, it will no longer appear on the End User interface, nor in the list of annotations to edit (on the Administrative Panel). Instead, LinkCheck will change the annotation's status to "Inactive," and by definition it will only appear in the "Wait" queue on the Main Menu of the administrative panel.

8.2 Execution with parameters

LinkCheck is also flexible in its functionality in that it may be run with parameters to control its execution. The program recognizes four runtime flags and their corresponding values (as listed in Table 7)

Table 7. LinkCheck parameters

Flag	Purpose
-fr	To specify the "from" address when sending out alerts of dead links (Default value: library_webmaster@colstate.edu)
-sv	To specify the mail server when sending out alerts (Default value: 127.0.0.1)
-db	To manually specify the database location (Default value: ..\Annotation Manager\fpdb\dbAnnotations.mdb)
-h	Help

The above-mentioned flags may be used in any combination and any order as needed.

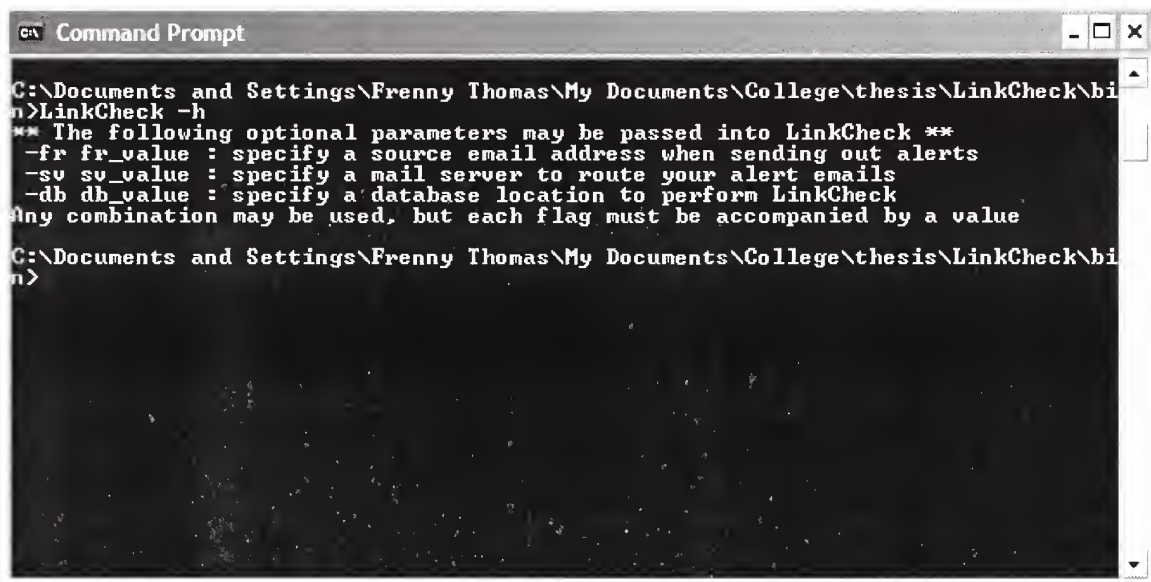
For example:


```
LinkCheck -fr simonschwob@colstate.edu
```

```
LinkCheck -fr simonschwob@colstate.edu -sv smtp.colstate.edu
```

```
LinkCheck -sv smtp.colstate.edu -db C:\fpdb\dbother.mdb
```

The -h flag will product output similar to Figure 36 to explain the use of each flag.



```
C:\ Documents and Settings\Frenny Thomas\My Documents\College\thesis\LinkCheck\bin>LinkCheck -h
** The following optional parameters may be passed into LinkCheck **
-fr fr_value : specify a source email address when sending out alerts
-sv sv_value : specify a mail server to route your alert emails
-db db_value : specify a database location to perform LinkCheck
Any combination may be used, but each flag must be accompanied by a value
C:\ Documents and Settings\Frenny Thomas\My Documents\College\thesis\LinkCheck\bin>
```

Figure 36. LinkCheck - Help screen

On the other hand, the program will not parse any erroneous parameters. Execution will terminate and the following message will appear:

“Invalid parameters passed. Type -h for help.”

8.3 Application Flowchart

Figure 37 presents a flowchart describing the operation of LinkCheck.

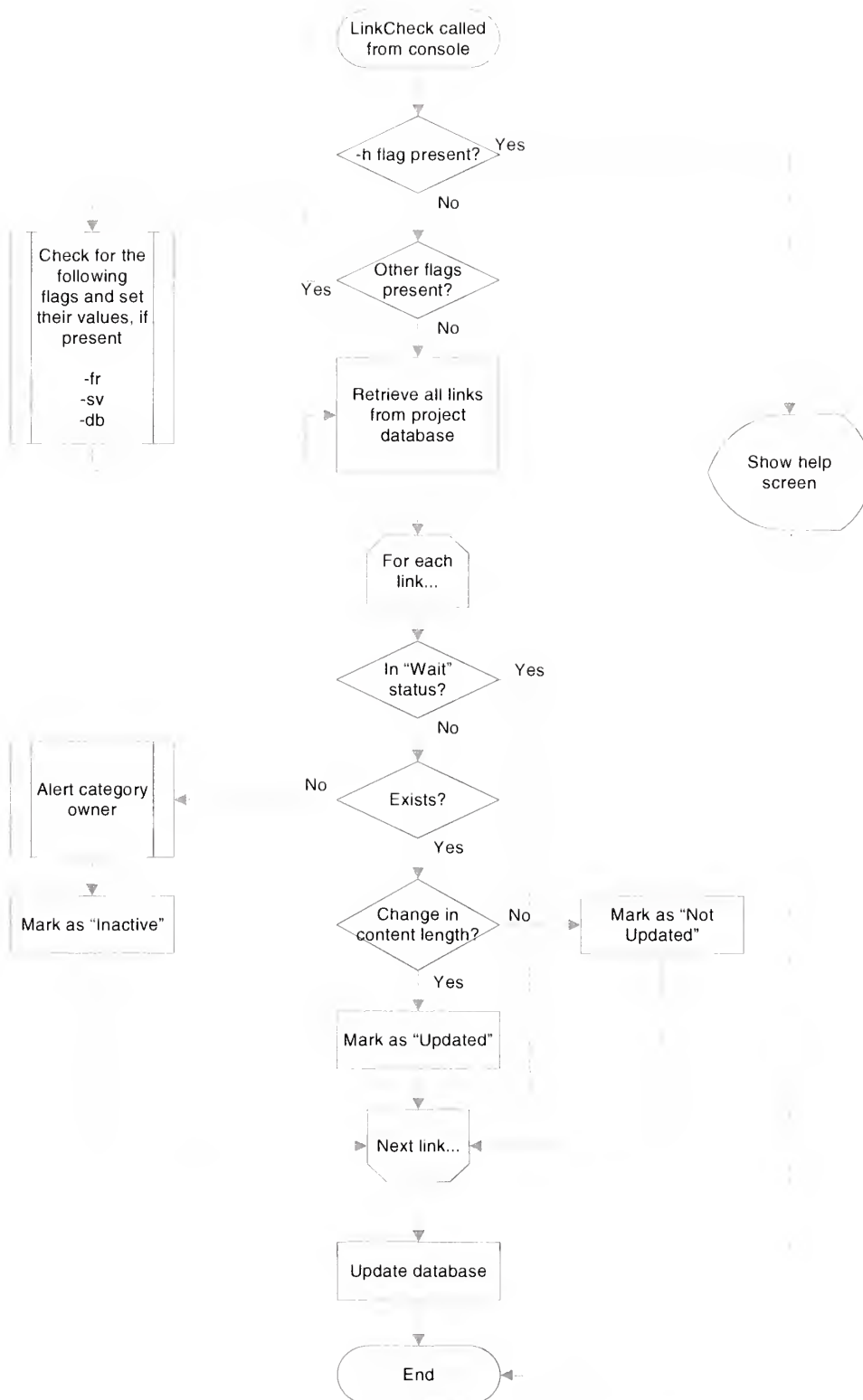


Figure 37. LinkCheck - Application Flowchart

9. Conclusion & Future Work

The Annotation Manager is meant to be a useful service for generating online annotations, maintained by librarians and available for public use. It acts as a tool for administrative users to add, edit, and remove annotations as necessary, without the burden of learning HTML and other web development technologies. The End User interface of this product is both practical and user-friendly through its nested-categories layout, search capabilities and suggestion box. Meanwhile, the Administrative Panel allows for various access levels to perform administrative functions as necessary; for example, the approval of suggestions, and maintenance of annotations, categories and/or users. Additionally, the Annotation Manager is unique in that the data presented will always be up-to-date, validating each resource link behind-the-scenes, hidden to the end user through the use of LinkCheck. The structure of the annotation database that drives this service involves a total of five relational tables within a Microsoft Access database. As a result of this, numerous categories and annotations can be stored for this product, and the hierarchical (tree-like) structure necessary for a library classification system can be maintained.

The Annotation Manager can be extended further with additional functionalities and features that can be added to the product to make it even more powerful, flexible and useful. For example, one of the immediate enhancements that can be made to the Annotation Manager is to improve its search capabilities to allow for more advanced queries. This can include the use of a keyword(s) and/or Boolean search to construct complex searches by choosing from a variety of options. This kind of advanced search is

helpful if the user wishes to look for specific items or if he/she wishes to create a precise search strategy.

Likewise, the program LinkCheck can also be extended to a Graphical User Interface (GUI) rather than a simple console application. Thus, the mode of display (console or GUI) will depend upon the method of execution. If the program is called from the server's task scheduler, it can execute quickly as a console application. But if the administrator wishes to control its execution (by specifying the mail server, from address, etc), he/she can run it manually with a GUI interface for text input.

Further enhancements to LinkCheck can also include the use of checksum or Cyclic Redundancy Check (CRC). Checksum is a method used by many computer network systems, in which the sender treats the incoming data as a sequence of binary integers and computes their sum [Comer04]. In this case, the checksum computation can be saved in the database and used for future comparisons to detect any page updates (rather than the content length). This will serve as a more thorough check because content length can easily remain the same, though the page content has truly changed. For example: if each letter in a webpage's title is replaced with another, the total content length will remain unchanged but the checksum computation would be different.

Annotation Manager has been developed using a desktop relational database (Microsoft Access). It is important to consider switching to a true client/server-based database system, such as Microsoft SQL Server, to increase the reliability, security, and scalability of the system [Aldex04]. Since SQL Server does not communicate directly with the database tables (it writes changes to an intermediate storage location called the Transaction Log), the back-end database is protected from corruption that may happen if

the network fails. And while Microsoft Access is designed for perhaps no more than 10 concurrent clients, the SQL Server client/server architecture can support hundreds of concurrent users without significant performance degradation.

As a current working model of this product, all the existing components of this product have been incorporated into a section of the Columbus State University Simon Schwob Memorial Library website (<http://library.colstate.edu/>). Static HTML pages of online annotations created prior to the development of Annotation Manager have been replaced with the user interface of the Annotation Manager. With its database-driven functionality, as well as its enhanced features to search and suggest links, the new library portal benefits both the students who use the resources, as well as the librarians who maintain them.

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Appendix: Installation Guide for LinkCheck

To install the LinkCheck program, one simply needs to run the Setup.exe file located on the project distribution disk. Note: the disk also contains an installer (.msi file) for LinkCheck. This installer uses Microsoft Windows Installer technology to manage the installation, including how to revert the system back to its previous state in case something malfunctions. However, end users are encouraged to run the Setup.exe, rather than the .msi file, to insure that Windows Installer will be installed if necessary [MSDN04]. Doing so will invoke a Setup Wizard (like the one shown in Figure 38) to continue installing the program. Selecting the subsequent “Next” buttons on the setup wizard will perform the installation.

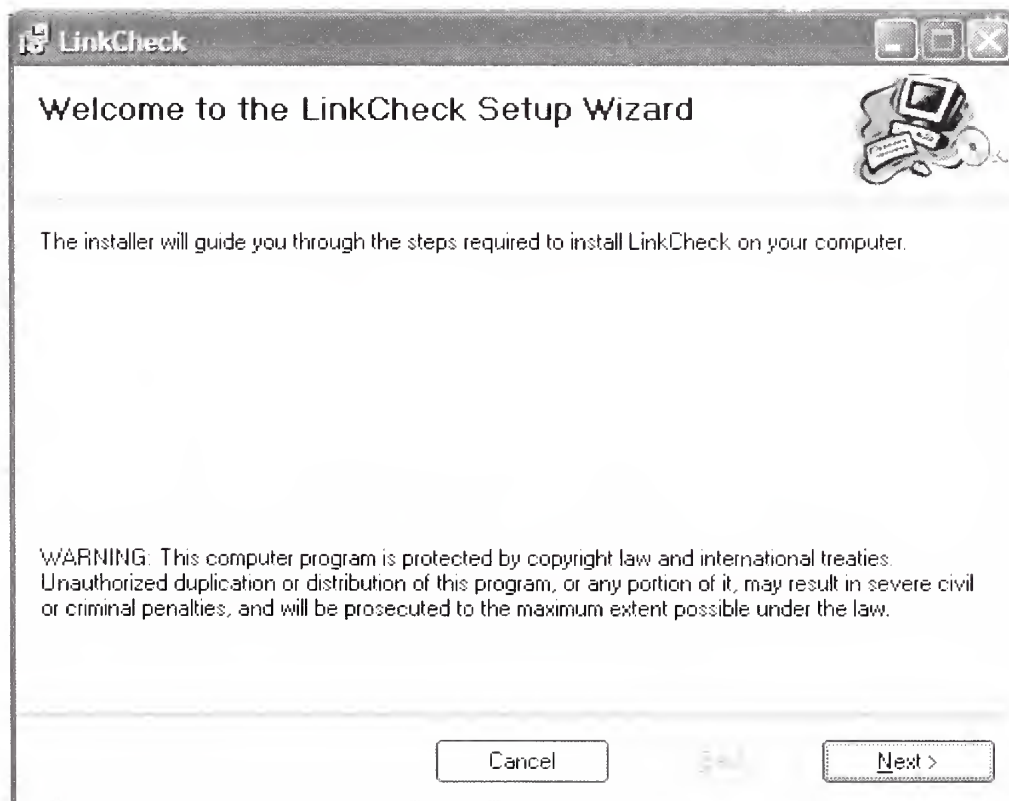


Figure 38. LinkCheck - Setup Wizard

It is recommended that the default installation folder path (“C:\Program Files\Annotation Manager\LinkCheck\”) remain unchanged. This is in order to keep the original file structure intact because LinkCheck expects the database to be located directly underneath the “Annotation Manager” folder (as shown in Figure 39). However an individual can also manually override the default database location by using the “-db” flag during execution.



Figure 39. LinkCheck - Folder Structure

Upon successfully installing LinkCheck, an “Installation Complete” screen will appear, and the program will be found within the user’s Start Menu, under the folder named “Annotation Manager.”

